SURVEY OF THE

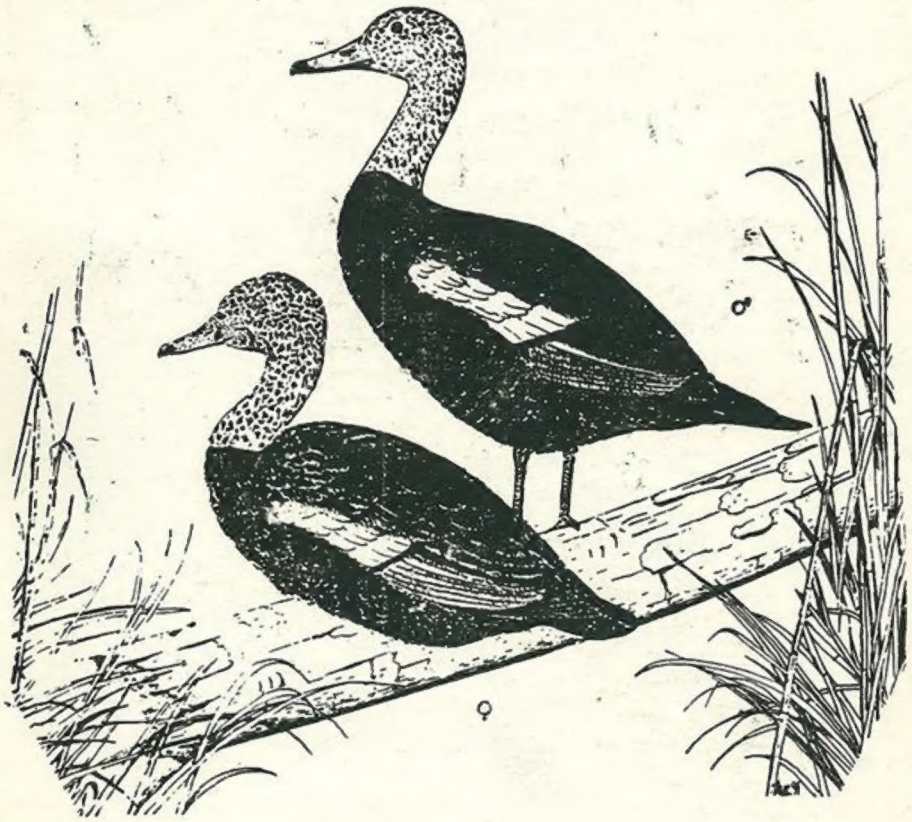
WHITE-WINGED WOOD DUCK

AND THE

BENGAL FLORICAN

IN TINSUKIA DISTRICT AND ADJACENT AREAS

Dr Anwaruddin Choudhury



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SURVEY OF THE

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IN TINSUKIA DISTRICT AND ADJACENT AREAS OF ASSAM AND ARUNACHAL PRADESH

Final Report

Dr Anwaruddin Choudhury

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Some abbreviations used in the text

EB	=	East block
FV	=	Forest Village
NGO	=	Non-Governmental Organisation
NP	=	National Park
PRF	=	Proposed Reserved Forest
TE	=	Tea Estate
VRF	=	Village Reserved Forest (where revenue earned is shared between Government and village communities)
WB	=	West block
WLS	=	Wild Life Sanctuary
WWW Duck	=	White-winged Wood Duck

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PREFACE

In 1987 and in 1989, I made brief surveys in Tinsukia district of Assam and adjacent areas of Arunachal Pradesh. The tropical rain forests and the wet savannah grassland of the area had always generated curiosity. So when I came to Tinsukia in June, 1992, for a 'long' stay, I had in my mind its wilderness with little-known but critically endangered species such as the White-winged wood duck. I stayed in Tinsukia for more than two years, i.e., upto August, 1994, and during this period, I surveyed most of the district as well as parts of Dibrugarh district (Assam), Dibang Valley, Lohit, Tirap and Changlang districts (all in Arunachal Pradesh).

The present survey has covered the White-winged wood duck, whose known stronghold in the world is the present study area, and also the Bengal florican, another critically endangered bird.

The main Objectives of the present survey were:

1. To obtain precise data on the present distribution and status of the WWW duck and the Bengal florican.
2. To obtain data on the ecology and behaviour of the birds, wherever possible.
3. To locate breeding and roosting sites for possible protection, and to determine the main threats to their survival.
4. To prepare a comprehensive Action Plan for the conservaton of the species.

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Special thanks are due to Bhuram Gogoi of Sopatoli, Paniram Das of Garamjan, Theebu of Dhekiajan, Leto Mili of Dambuk and Nur Hussain, who not only accompanied me in many of the trips but their knowledge and expertise also helped a lot.

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SUMMARY

The White-winged wood duck *Cairina scutulata* is among the most threatened waterfowl of the world. A bird of the tropical wet evergreen forest, it is threatened by habitat destruction and hunting. The Bengal florican *Houbaropsis bengalensis* is also a threatened bird of the world. It is the rarest bustard in the world. The florican lives in tropical moist grassland.

Field works have been carried out from July, 1992, to July, 1994, in Tinsukia and Dibrugarh districts of Assam and in parts of Dibang Valley, Lohit, Changlang and Tirap districts of Arunachal Pradesh.

The WWW duck have been observed in different parts of Tinsukia district while its existence could be confirmed in the other districts of the study area. The clutch and brood sizes were found to be 5.07 and 5.23 respectively. More than 30 nesting sites have been discovered. Ground nesting have been recorded for the first time. The usual group size appeared to be a pair or a male and two females. The estimated population is worked out to be 291 in Tinsukia and Dibrugarh and 59 in parts of Arunachal Pradesh (base : density of one duck per 233 hect. in Dum Duma RF).

The Bengal florican is found in Tinsukia, Dibang Valley and Lohit districts. A few may still occur in parts of Dibrugarh. Three observations recorded in the study area. The estimated population is worked out to be around 54 - 70 in the study area proper and around a hundred if the adjacent areas such as Kobo chapori and D'Ering Sanctuary are taken into account.

Habitat destruction continues to be the major threat to the survival of both the species. Collection of live ducklings is another major threat. Pollution of waterbodies by oil installations and tea plantations is also a matter of great concern. The captive breeding of the WWW duck should not be taken up again. New potential areas for conservation have been identified and recommended for national park and wildlife sanctuary. Among the key sites were the Upper Dihing RFs for the WWW duck and the Dibang RF for the Bengal florican.

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1 INTRODUCTION

The White-winged wood duck *Cairina scutulata* (Muller 1842), is among the most threatened waterfowl of the world. It is also among the most poorly studied. A bird of the tropical wet evergreen forest, it is threatened by habitat destruction and hunting. The duck is thinly distributed over large forest tracts and lives in pairs or small family groups.

The WWW duck was once not uncommon in the pools and channels of tropical forests of South-East Asia. It extended from Assam through Myanmar to Indo-China, Sumatra and Java (Ali & Ripley, 1983, Robinson & Kloss, 1910-11; Robinson, 1915; Smith, 1942; Smythies, 1953; Stanford & Ticehurst, 1939). Except for Java, where no recent report, the extent of general distribution of the duck has remained same. The distribution pattern has become extremely thin over a wide area from Assam to Sumatra.

The duck was widespread in north-eastern Indian states of Assam and Arunachal Pradesh, with records from Nagaland, Meghalaya and Manipur also. In the eastern Assam districts of Dibrugarh (including Tinsukia) and Lakhimpur (including Dhemaji) it was common (Hume & Marshall, 1880). The WWW duck is a poorly-studied bird and comprehensive data based on field work are few and far between. Husain and Haque (1982) carried out studies in Pablakhali Wildlife Sanctuary of Bangladesh, Chambers (1990) and Rudyanto *et al* (1993) in Indonesia, and Parr *et al* (1993) in Thailand. In India, brief reports based an short field visits have been made available by Choudhury (1993a,b; 1994a, ; 1995a,b), Gee (1958), Das (1995), Mackenzie and Kear (1976), Mukherjee (1961) and Talukdar (1994). Green (1992) has compiled a report putting together most of the available information on the species till about 1990-91.

The Bengal florican *Houbaropsis bengalensis* (Gmelin 1789) is also a threatened bird of the world. In fact, it is the rarest bustard in the world. A bird of tropical moist grassland, it is threatened by habitat destruction and hunting.

The Bengal florican once extended from UP terai through Nepal to the eastern extremity of the Brahmaputra Valley, then through Bangladesh to Cambodia and Vietnam (Delacour, 1929; Inskipp & Inskipp,1983; Rahmani *et al*, 1990). At present , the species is confined mostly to a few pockets in Uttar Pradesh, Nepal, Assam and Arunachal Pradesh with sporadic reports from north Bengal, Cambodia and Vietnam.

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Field works have been carried out in recent years in Nepal (Inskipp & Inskipp, 1983, 1985) and in India (Rahmani *et al*, 1990).

Locally, the WWW duck is known as *Deo-hanh* (Assamese) and *Jongli china-hans* (Bengali and Tea-tribes) while the florican as *Ulu moira, Ulu-moura* (Assamese), *Dahar* (Bengali), *Dao tiriling* (Bodo) and *Hudumura* (Mising).

2 METHODS

Field works have been carried out from July, 1992, to July, 1994, with a short trip in November, 1995. During this period, I spent about 1600 hours inside or near jungle (including grassland) in the study area (1760 hours including preliminary survey of 1987 and 1989).

Tinsukia town was my Headquarters and the base from where most trips were carried out.Camps where I stayed for a night or more within the study area were : Baluchar, Chapakhowa (Sadiya), Dhola, Digboi, Dighaltarang, Dum Duma, Guijan, Jairampur, Kakopathar, Kolomy, Margherita, Mingmung (Amarpur) (all in Tinsukia district) ; Dibrugarh (Dibrugarh district); Deban, Jairampur, Miao (Changlang district); Longding (Tirap district); Kalai basti, Wakro (Lohit district); Bomjir, Dambuk, Mayodia, Roing, Sally lake and Santipur (Dibang Valley district).

Most of the observations were carried out on foot. Vehicles have been used to reach the sites. In Dibru-Saikhowa WLS, country-boats had been used extensively. Motor-boats had been used only in the Lohit river.Country boats had also been used in the Burhi-Dihing river and a dug - out canoe in Glao lake. A trained elephant was used to survey part of Choraipung Range of Upper Dihing (West block) RF.

During the survey, potential wetlands (such as jungle pools, lakes, marshes and sluggish channels) and grasslands were indentified from maps, through discussion with local villagers, Forest officials, hunters, as well as personal experience, and then visited on foot, vehicle, elephant or country-boat. Foot- transect, vehicle-transect and boat-transect along existing paths, trails, roads and channels were made to see any bird in flight or to encounter any duck in unrecorded pools. Select patches of grasslands were combed for the floricans by three people walking at about 15 - 20 metres apart.

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Daily logs of each visit was maintained in details. Behaviour and activities recorded every 5 minute interval, and any interesting behaviour or movement within the interval had also been documented.

Obervations were done with the help of a 10x50 telescope and a 10x46 spotting scope. Photographs were taken with a Canon T50 still camera with a 200 mm tele and a Tamron 75-250 mm tele - zoom. A Vivitar 3x converter was also used occasionally.

The villagers including fishermen, graziers, encroachers, wood - cutters, tea-garden labourers, staff of the oil mines, and the Forest officials were interviewed. They were also shown drawings of the duck and the florican for indentification (cover illustrations). All local reports have been thoroughly cross-checked before acceptance. For cross- checking, I used a few select persons who were my local contacts, field guides and who had observed the birds in wild or in captivity, and select group of Forest staff who were well acquainted with the species.

The total direct observation by me of the duck in the wild was of 1170 minutes or 19.5 hours with 390 minutes or 6.5 hours as the maximum on a single day. The florican could be observed for only about 25 minutes in three different localities.

A methodology has been devised for estimating the population density and the probable total population of the duck and the florican. The same is still being given final touches and will be published elsewhere in due course.

3 STUDY AREA

3.1 The present survey covered Tinsukia and Dibrugarh districts of Assam, and parts of Dibang Valley, Lohit, Changlang and Tirap districts of Arunachal Pradesh (27°0′ to 28°20′ N, 95°0′ to 96°30′ E). A small portion of Dhemaji district adjacent to Dibru-Saikhowa WLS have also been covered (Fig 3.1).

Physiographically, bulk of Tinsukia and Dibrugarh districts are plains being part of the Brahmaputra Valley. Dibang Valley, Lohit, Changlang and Tirap districts are hilly and mountainous with flat areas near larger rivers such as the Dibang, the Lohit and the Noa-Dihing. The Mishmi

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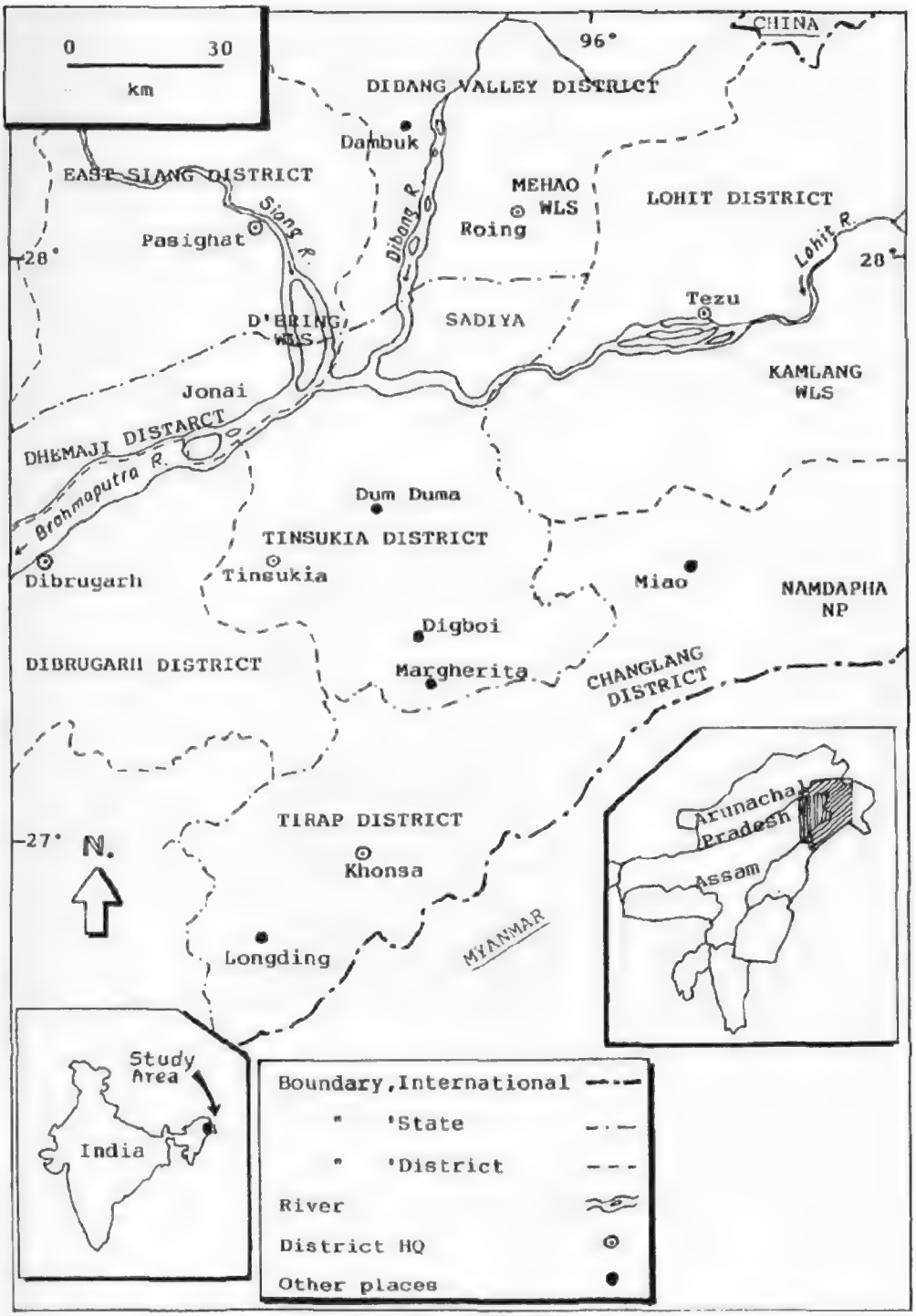

Fig 3.1 The Study Area

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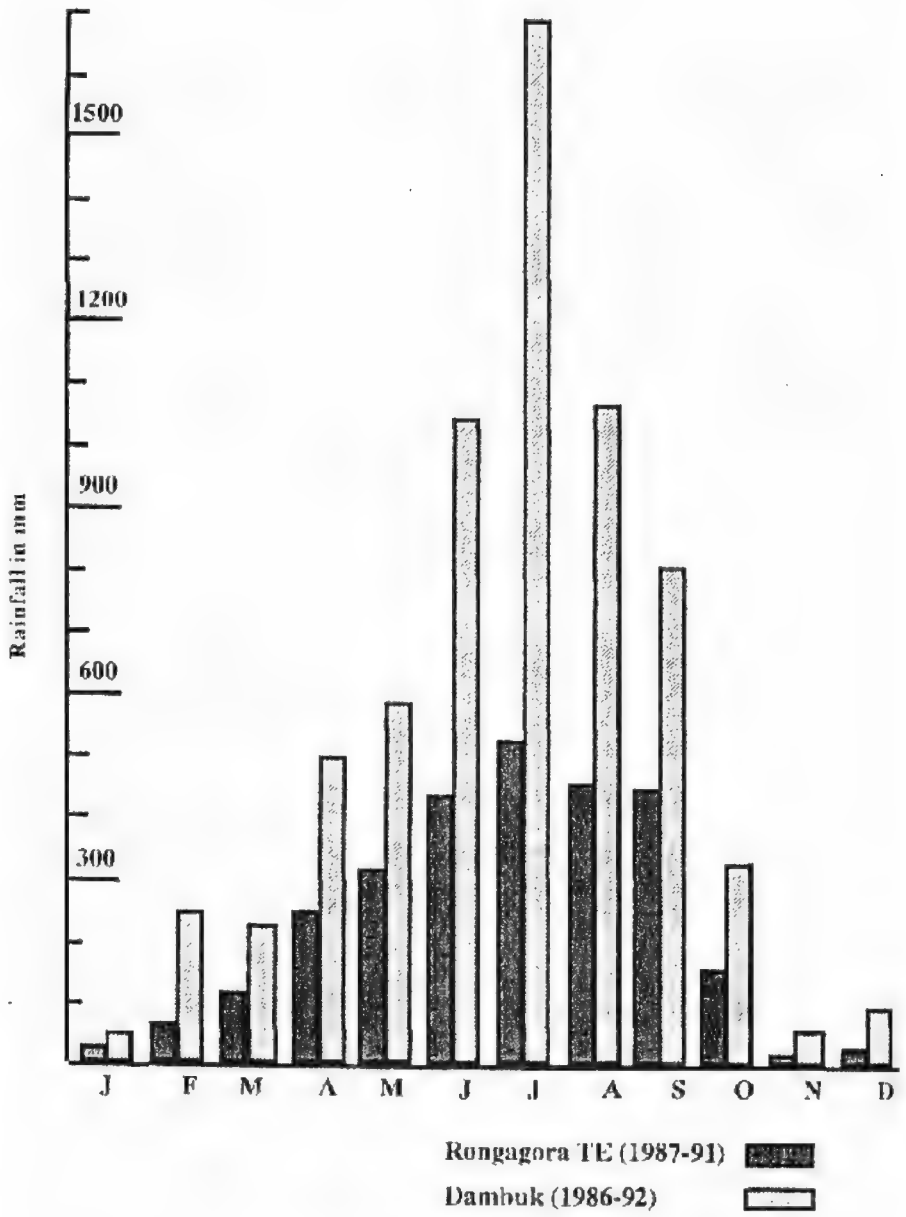

Fig 3.2 Average Monthly Rainfall recorded at two stations in the study area (source : Rangagora TE, PWD and CWC, Dambuk).

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Hills cover Dibang Valley and part of Lohit; Dapha Bum Range covers part of Lohit and Changlang while the remaining areas of Changlang and the entire Tirap district forms part of Patkai Range. The elevation in the study area ranged from 100 metre above sea level near Dibrugarh to 2500 metre in Mehao WLS. The highest point of the study area is 4500 metre (Dapha Bum), which, however , could not be covered.

The area enjoys tropical monsoon climate with hot and wet summer and cool and usually dry winter. Winter rains are not uncommon. Higher parts of Mishmi Hills and Dapha Bum experiences heavy snowfall in winter. The area receives heavy rainfall, from 2800 mm (range : 2300 - 3800 mm) at Rongagora TE near Guijan to 6500 mm(range : 4100 - 10,400 mm) at Dambuk(Fig 3.2). The number of rainy days was 109 (range : 94 - 117) at Rupai TE and 139 (range : 135 - 40) at Chabua TE. The main rainy months are June, July, August and September. The average temperature ranges from 0° to 32° C (range : –0° to 35° C).

The natural vegetation in the area is mostly tropical wet evergreen 'rain forest' with wet savannah grassland in the floodplains of the Brahmaputra, Lohit and the Dibang rivers. Salix-swamps are found in parts of Dibru-Saikhowa WLS. In the higher hills and mountains occur the sub -tropical evergreen forest. Alpine vegetation is found in the highest parts of Mishmi Hills and Dapha Bum.

The most noteworthy tree species of the area is the tall *Dipterocarpus macrocarpus* (Hollong), which is found south of the Brahmaputra and the Lohit rivers. Other trees of the lowland forest includes *Mesua ferrea* (Nahor), *Shorea assamica* (Mekai),*Duabanga sonneratoides* (Khokan), *Terminalia myriocarpa* (Hollock), *Artocarpus chaplasa* (Cham Kothal), *Anthocephalus cadamba* (Kadam), *Dillenia indica* (Ou-tenga), *Salix tetrasperma* (Bher), *Bischofia javanica* (Uriam), *Bombax ceiba* (Simul) and various *Ficus* spp. In the higher areas, various species of Oak trees (*Schima* spp. *Quercus* spp. etc) are found.

The grasslands are dominated by *Imperata cylindrica* (Ulu-kher), *Arundo donax* (Nal reed), *Phragmites karka* (Khagori), *Erianthus ravaniae* (Ekra), *Saccharum* spp. etc.

3.2 Description of some select study sites :

3.2.1 DANGORI RF. 27°38 ´ N, 95°38´ E. Area, 9.2 km². Elevation, 130 m. In Tinsukia district. Evergreen rain forest, now mostly degraded, on flat plains. A KEY SITE for the WWW duck.

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3.2.2 DIBANG RF. 27° 55′ - 28°09′ N, 95° 30′ - 43′ E. Area, 198.0 km²; formerly covered 303.4 km². Elevation, 140 - 200 m. Large pockets de - reserved for settlement. In Dibang Valley district. Evergreen forest with excellent grassland in southern and eastern parts. Mostly flat, in the 'Bhabar' zone. A KEY SITE for the Bengal florican, also WWW duck.

3.2.3 DIBRU-SAIKHOWA WLS . 27°35′ - 50′ N, 95°10′ - 40' E. Area, 640 km².Elevation, 110 - 130 m. In the flood-plain of the Brahmaputra and the Lohit rivers, falling partly in Dibrugarh and partly in Tinsukia district. Originally an evergreen forest, habitat changed due to sinking of the area in 1950 earthquake. Succession of vegetation resulted in domination of deciduous species. Also salix swamps. KEY SITE for both the WWW duck and the florican.

3.2.4 DIRAK RF. 27°13′ - 18′ N, 95°32′ -37′ E. Area, 30.4 km². Elevation,120 - 450m. In Tinsukia district. Tropical evergreen rain forest in the foothills of Patkai Range. Adjacent and contiguous to Upper Dihing RF (West block) and Namsangmukh VRF.

3.2.5 DUM DUMA RF. 27°33′ - 38′ N, 95°40′- 46′ E. Area, 28.8 km². Elevaton, 140 m. In Tinsukia district . Tropical evergreen rain forest on flat plains. Habitat partly degraded. KEY SITE for the WWW duck.

3.2.6 JOYPUR RF. 27°06′ - 15′ N, 95° 22′ - 29′ E. Area, 108.7 km². Elevation, 120 - 474 m. In Dibrugarh district. Tropical evergreen rain forest in the foothills of Patkai Range. Adjacent and contiguous to Upper Dihing RF (WB) and Namsangmukh VRF. KEY SITE for WWW duck.

3.2.7 KAKOJAN RF. 27°28′ - 31′ N, 95°37′ -40′ E. Area, 23.2 km². Elevation, 120 - 140 m. In Tinsukia district. Tropical evergreen rain forest on flat and slightly undulating plains. Adjacent and contiguous to Upper Dihing RF (EB).

3.2.8 KAMLANG WLS. 27°40′ - 50′ N, 96°20′ - 50′ E. Area, 783.0 km². Elevation, 400 - 4500m. In Lohit district, on the northern facies of Dapha Bum Range, hilly and mountainous. Tropical evergreen rain forest in the lower slopes and sub-tropical evergreen forest in the higher areas. Alpine vegetation occurs in the highest parts of Dapha Bum. Highest areas experience snowfall in winter.

3.2.9 KUMSONG RF. 27°42′- 46′ N, 95°43′- 47′ E. Area, 22.5 km². Elevation, 130 m, In Tinsukia district. Tropical evergreen forest on the

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flood plains of the Lohit and the Noa-Dihing rivers. Adjacent to Hahkhati and Mesaki RFs.

3.2.10 MEHAO WLS. 28°03′ - 14′ N, 95°45′ - 96 °02′ E. Area, 281.5 km². Elevation 350 - 3560 m. In Dibang Valley district, on the southern facies of Mishmi Hills, hilly and mountainous. Tropical evergreen forest on the lower slopes and sub - tropical evergreen forest in the higher areas. Highest parts experience snowfall in winter.

3.2.11 NAMCHIK RF. 27°23′ N, 96°0′ E. Area, 49.8 km². Elevation, 170 - 300 m. In Changlang district, on flat and undulating plains at the foot of Patkai Range. Tropical evergreen rain forest. Encroachment is the main threat for the area. Adjacent to Tinkopani and Namphuk RFs.

3.2.12 NAMDAPHA NATIONAL PARK . 27°20′- 40′ N, 96°15′-55′ E. Area, 1985.2 km². Elevation, 200 - 4500 m. In Changlang district. The area is the basin of the Noa-Dihing river. Parts of Dapha Bum and Patkai Ranges are within the area. Tropical evergreen rain forest on the lower slopes and sub - tropical evergreen forest in the higher areas . Alpine vegetation occurs in the highest parts of Dapha . Highest areas experience snowfall in winter. A KEY SITE for the WWW duck.

3.2.13. NAMPHAI RF. 27°23′ - 26′ N, 95°54′ - 59′ E. Area, 21.0 km². Elevation, 150 - 200 m. In Tinsukia district, on flat plains with a small undulating area. Tropical evergreen rain forest. Adjacent to and contiguous with Tinkopani, Namphuk, and Namchik RFs. Some encroachment in the western areas. A potential KEY SITE for the WWW duck.

3.2.14 NAMPHUK RF. 27°24′ - 28′ N, 95°55′ - 96°02′ E. Area, 57.2 km². Elevation, 150 - 190 m. In Changlang district, on flat plains. Tropical evergreen rain forest. Adjacent to and contiguous with Namchik, and Namphai RFs. Encroachment is the main threat to the area. A potential KEY SITE for the WWW duck.

3.2.15 NAMSANGMUKH VRF. 27°13′ N, 95°30′ E. Area, 57.2 km². Elevation, 120 - 400m. In Tirap district, on undulating plains at the north - western facies of Patkai Range. Adjacent to Dirak, Upper Dihing (WB), and Joypur RFs. Encroachment and logging are the main threats to the area. Forest type is tropical evergreen.

3.2.16 TINKOPANI RF. 27°20′ - 25′ N, 95°56 - 96°02′ E. Area, 30.3 km². Elevation, 150 - 240 m. In Tinsukia district, on undulating plains at the foot of the Patkai Range. Adjacent to and contiguous with Namphai and Namchik RFs. Tropical evergreen forest.

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3.2.17 TOKOWANI RF. 27°29′ - 32′ N, 95°36′ E. Area, 5.0 km². Elevation, 130 m. In Tinsukia district, on flat plains. Adjacent to Kakojan RF. Tropical evergreen forest.

3.2.18 TORANI RF. 27°28′ -31′ N, 95° 44′ - 47′ E. Area, 20.4 km². Elevation, 140 - 50 m. In Tinsukia district, on flat plains. Tropical Evergreen rain forest.

3.2.19 UPPER DIHING RF (EAST BLOCK). 27°20′ -29′ N, 95°37′ - 46′ E. Area, 132.0 km². Elevation, 120 - 190 m. Slightly undulating plains. Tropical evergreen rain forest. Adjacent to Kakojan RF. Presence of large Forest villages, encroachment by the Forest villagers and pollution by crude oil mining are the major threats. A KEY SITE for the WWW duck.

3.2.20 UPPER DIHING RF (WEST BLOCK). 27°14′ - 28′ N, 95°26′-38′ E. Area,275.0 km². Elevation, 120 - 240 m. In Tinsukia district, flat plains towards north and undulating plains towards south. Tropical evergreen rain forest. Adjacent to Dirak, Joypur and Namsangmukh RFs. Presence of large Forest villages, encroachment by the Forest villagers and pollution by crude oil mining are the major threats. A KEY SITE for the WWW duck.

4 THE WHITE-WINGED WOOD DUCK

4.1 *Field Characteristics :*

The WWW duck is larger than domestic duck. The male is visibly larger than female. The male is chestnut -brown above and dull chestnut below. The breast is glistening blackish and on closer observation under the sun, looks deep glossy greenish - black. Head and neck white with black speckles. Bill bright yellowish with black blotches. The female is dull chestnut - brown with more black speckles on head and neck. Bill drab yellowish with black blotches. The immature birds have more browner body and their head and neck look blackish from distance (can be described as black with white speckles !).

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The speculum in both the sexes is bluish-grey bordered anteriorly by a broad black band. However, the most characteristic feature of the species is large white patch on wing-shoulder. Legs and feet in both the sexes are orange or yellowish.

The downy ducklings are dark chocolate-brown and yellow. The most noticeable characteristic is the divided eye-stripe which is not found is any other species.

4.2 *Distribution* :

During the survey, the WWW duck has been observed in Dum Duma RF, Upper Dihing RF (West block), Dangori RF, in Digboi town and in Dibru-Saikhowa WLS. The presence of the duck had been confirmed in Burhi-Dihing RFs, Dirak RF, Duarmara RF, Digboi RF (West block), Hahkhati RF, Kakojan RF, Kotha RF, Kumsong RF, Mesaki RF, Namphai RF, Phillobari RF, Tinkopani RF, Tokowani RF, Torani RF, and Upper Dihing RF (East block), all in Tinsukia district; Joypur RF and Namdang RF in Dibrugarh district; Dibang RF and Mehao WLS in Dibang Valley district; Koriapani RF, Namchik RF, Namdapha National Park and Namphuk RF in Changlang district, and Namsangmukh VRF in Tirap district.

No recent report from Kundil Kaliya RF, Sadiya Station RF, Kukuramora RF (all in Sadiya Sub - division of Tinsukia district), Namdang RF (Dibrugarh district), Namsai RF (Lohit district), Noa-Dihing RF (Changlang district) and Borduria VRF (Tirap district). Other lowland forest of Lohit and Changlang, especially Manabum, Tengapani and Diyun RFs also contain possible WWW duck population but these areas could not be surveyed in details.

The WWW duck has also been recorded near Longding (Tirap district), Rongagora TE, Bordubi TE, Koomsong TE, Phillobari TE, and Bogapani TE, which are,however, not permanent habitats but occasional haunts. The species also haunts ponds and watered fields in Lakhipathar FV, Choraipung FV, Dhekiajan FV, Borjan FV, Dimoruhola FV and Nagajan (Fig. 4.1 & 4.2).

Elsewhere in Assam, the continued occurrence of the duck has been confirmed in Nameri WLS (Sonitpur district), Hollongapar RF (Jorhat district), and in Nambor RF (North block ; Golaghat and Karbi Anglong districts). In Arunachal Pradesh, it has been recorded from Pakhui WLS (Choudhury, 1995a) and in Meghalaya, reports have come from Balpakram National Park of South Garo Hills.

The limiting factors of the distribution of the duck in the study area are unsuitable mountainous terrain (bulk of Arunachal Pradesh) and

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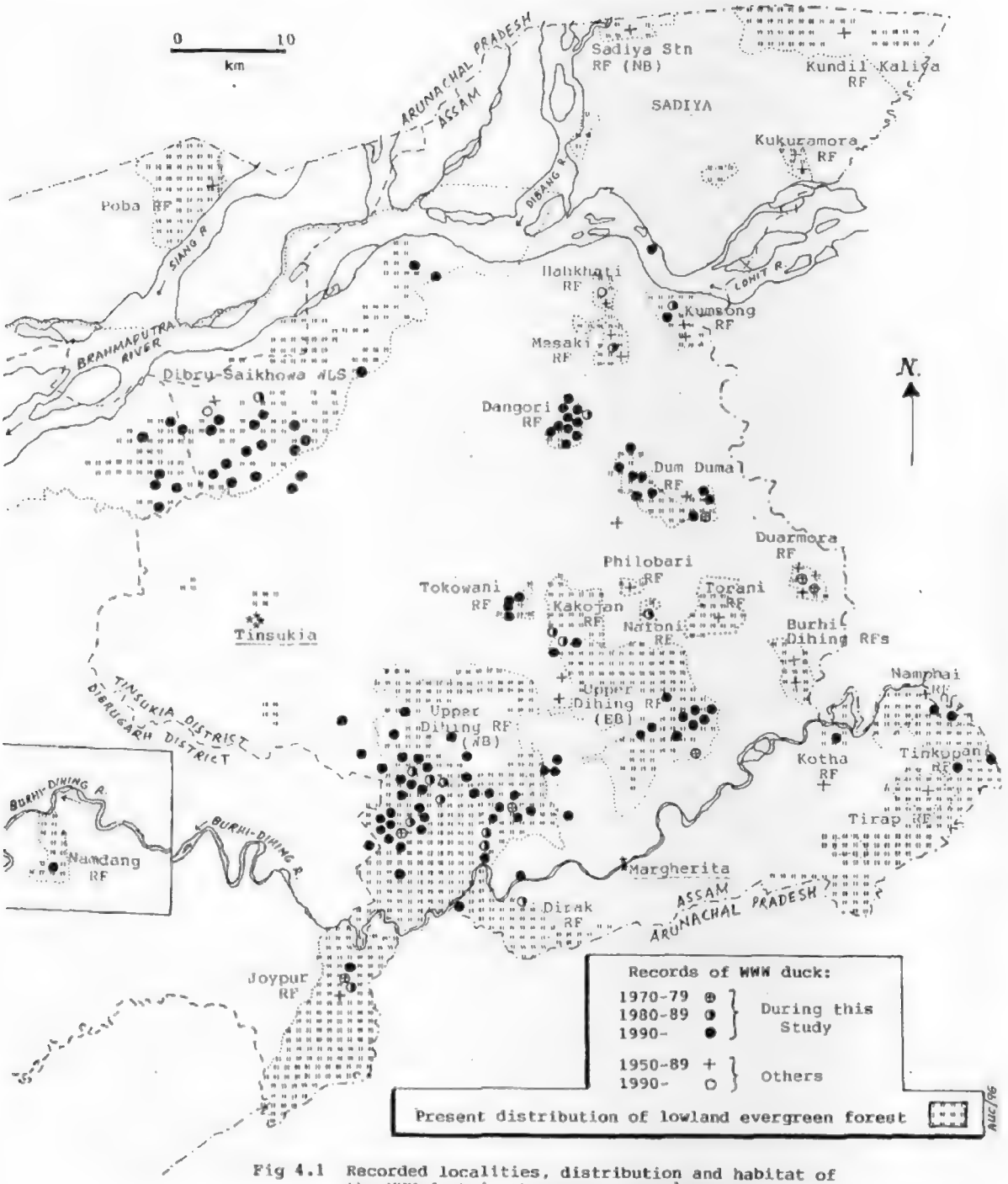

Fig 4.1 Recorded localities, distribution and habitat of the WWW duck in the study area: Assam

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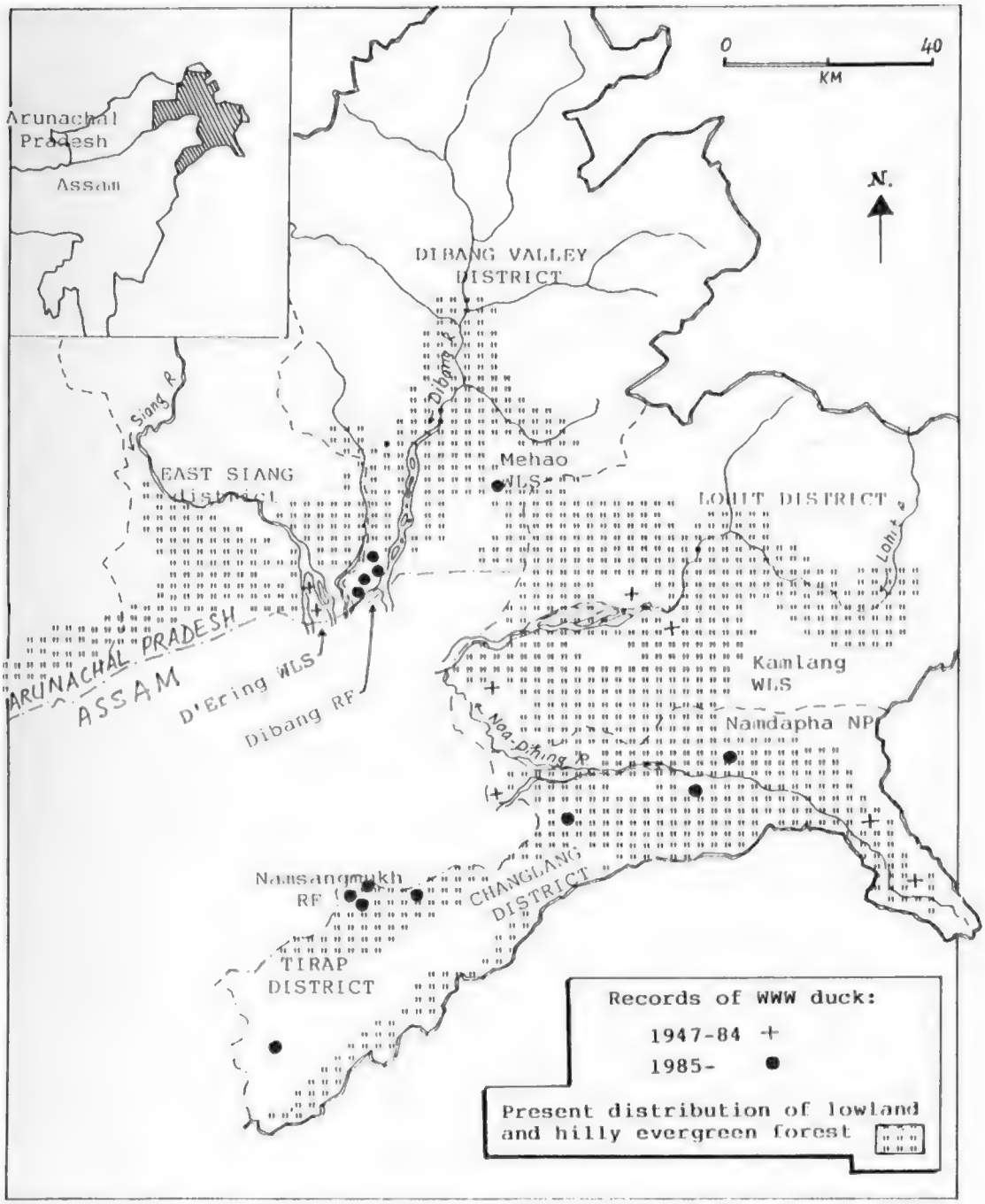

Fig 4.2 Recorded localities, distribution and habitat of the WWW duck in the study area: Arunachal Pradesh.

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clearing and occupation of suitable habitat for human settlements and tea plantations (bulk of Dibrugarh and Tinsukia).

Localities of direct field observations are listed in table 4.1, while all other records including past ones and reports are listed in Appendix I.

4.3 *Habitat:*

The WWW duck affects jungle pools (natural depressions, ditches, small reservoirs, etc.), sluggish channels, river-pools, secluded *beels*, and also lagoons of larger rivers, inside or near evergreen forests. They have also been observed in ponds dug for oil mining. Such ponds provide water required during drilling and also act as storage for spills or refuse. Hence, many such ponds are heavily polluted.

Most of the localities of observation and other records were in tropical wet evergreen rain forest. In Dibru-Saikhowa WLS, where the habitat is in a transitional stage, the duck also haunts marsh and salix swamps surrounded by mixed deciduous forest. In Mehao WLS, it has been recorded in a large lake surrounded by sub-tropical evergreen forest. In parts of Dibru-Saikhowa WLS and also in Dibang RF, it has been recorded in pools amidst dense elephant grass. For the WWW duck, the minimum habitat requirement are small waterbodies lined with good tree - cover (for seclusion, safety, roosting, and nesting). Many of the known key sites such as Dangori RF, Dum Duma RF, etc., have been turned into secondary and degraded forest due to logging, however, the duck seems to be doing well although in depleted number.

Elsewhere in Assam, the duck has been recorded from waterbodies inside tropical evergreen and semi -evergreen forests in Hollongapar RF , Nambor (North block) RF, Nameri WLS and Katakhal RF (Hailakandi district) as well as tropical deciduous forests in Doboka RF, Kaki RF and Lumding RF (all in Nagaon district). Most of the waterbodies in the deciduous forests mentioned above, are lined with evergreen trees and shrubs, often with dense reeds.

The localities in Tinsukia and Dibrugarh districts where the duck have been recorded are between 100 and 140m elevation. In Arunachal Pradesh, it has been recorded at 810m in Namdapha National Park and at about 1400 m in Mehao lake in Mehao WLS (Choudhury, 1995a). At Jatinga, in North Cachar Hills district, one duck was caught at an elevation of *c.* 600 m (Phukan, 1987). The altitude (except high mountains, such as Dapha Bum) seems to be not a limiting factor, however, the hills and hill-slopes are characterised by fast - flowing streams and the stagnant waterbodies suitable for the duck are very few.

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Table 4.1 Direct Field Observation of the White-winged Wood Duck in Tinsukia District

Date	Location	Coordinates	No. of Ducks	Remarks/Note
10 December, 1992	S of Kasijan, Dum Duma RF	27°36 ´ N,95°42 ´ E	1	Alighted from a *Dipterocarpus macrocarpus* tree. Time : 06.40 am.
10 December, 1992	SW part of Dum Duma RF	27°35 ´ N, 95°42 ´ E	3	In flight over the Dum Duma river. Time: 07.22 am.
27 February, 1993	Near Jorajan, Choraipung Range, Upper Dihing (West Block) RF	27°20 ´ N, 95°30 ´ E	3,3	Two Groups : One in a pool, other roosting on a tree-branch. Time: 12.38pm, observed continuously for 137 minutes.
3 March 1993	Digboi Town	27°23 ´ N, 95°37 ´E4	1	In a small reservoir by the side of NH 38. Time : 8.30 am.
24 April,1993	Near Jorajan, Choraipung Range, Upper Dihing (West Block) RF	27°20 N, 95°30 E 3	2	At the edge of a pool. Flew off. Time : 12.10 pm.
25 May,1993	Ghulajan, Dum Duma RF	27°36 ´ N,95°41 ´ E	2	One sitting in a big *Ficus* tree, other in a pool. The former also flew down to water. Time : 08.00 am.
22 August,1993	Near Jorajan, Choraipung Range, Upper Dihing (West Block) RF	27°20 ´ N. 95°30 ´ E	1	Perched on a log in a pool. Time:08.45am
3 October, 1993	NE of Jorajan, Choraipung Range Upper Dihing (West Block) RF	27°20 N. 95°30 ´ E	1	In a pool. Time 09.55 am.Observed continuously for 190 minutes.

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Table 4.1 (cont'd)

17 October,1993	NE of Jorajan, Choraipung Range Upper Dihing (West Block) RF	27°20 'N, 95°30 ' E	1	In a pool. Time : 07.10 am. Observed continuously for 100 minutes.
24 November, 1993	Laijuri Beel, Dibru-Saikhowa WLS	27°35 'N, 95°21 ' E.	2	In silhouetted flight from *beel* towards forest.Not beyond doubt.
2 December, 1993	NE of Jorajan, Choraipung Range, Upper Dihing (West Block) RF	27°20 ' N, 95°30 ' E	3	Perched on a tree branch, then flew down to a pool. Time : 09.30 am. Observed continuously for 145 minutes.
2 December, 1993	Near Jorajan, Choraipung Range, Upper Dihing (West Block) RF	27°20 'N, 95°30 'E	3	Perched on a fallen log. Time : 01.25pm. Observed for 47 minutes.
7 December, 1993	Near Jorajan, Choraipung Range Upper Dihing (West Block) RF	27°20 ' N, 95°30 'E	2	In a small pool. Took off at my sight. Time : 08.26 am.
15 January, 1994	Pawoi Nadi, Upper Dihing (West Block) RF	27°20 ' N,95°36 'E	2	In a sluggish channel, floating an water. One -by-one, they flew off upstream. Time : 10.00 am.
16 January, 1994	Near Jorajan, Choraipung Range Upper Dihing (West Block) RF	27°20 ' N, 95°30 ' E	3	Disturbed by my Field Assistants while they were in a nullah/pool. I saw them in flight. Time : 10.55 am.

(cont'd)

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Table 4.1 (cont'd)

16 January, 1994	Near Jorajan, Choraipung Range Upper Dihing (West Block) RF	27°20 ´ N, 95°30 ´ E	1	In a pool; took off at my sight. Time : 11.40 am.
1 May, 1994	Torali-Pathar, Dibru-Saikhowa Wildlife Sanctuary	27°36 'N,95°19 'E	1	Doubtful. Sighted in a vegetation - covered flooded area. Time : 01.30 pm.
11 June, 1994	Ghulajan, Dum Duma RF	27°36 ´ N, 95°41 'E	3,1	One duck perched in a *Dipterocarpus macrocarpus* tree, then flew to a *Anthocephalus cadamba* and ultimately to a big *Ficus* tree. Two more joined. Late in the evening, one more seen in flight. Time : 09.25am. Observed continously for 390 minutes — my longest.
15 Nov,1995	Lohali, Dangori RF	27°38 'N, 95°38 'E	14	Seven ducks in low flight, followed by 4 more. Then settled in trees, *Dipterocarpus macrocarpus*. One more came in. Then call from two other trees suggesting at least two more ducks (may be more also). Time : 04 :35 pm. Observed for 25 min.
16 Nov,1995	Lohali, Dangori RF	27°38 'N, 95°38 'E	7	Foraging, preening, walking on the ground with short grass and small water-bodies. Time : 5.40 am. Observed for 65 minutes.

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The evergreen forest on flat terrain, as found in most of Tinsukia, parts of Lohit and Changlang continue to be the most favoured habitat with higher density of ducks.

So far as the use of particular trees are concerned, the ducks have been found roosting and perching in *Dipterocarpus macrocarpus* (Hollong), *Ficus* spp. (Jori), *Artocarpus chaplasa* (Cham kothal), and two unidentified trees. Nesting had been recorded in *Salix tetrasperma* (Bher), *Bischofia javanica* (Uriam, three samples) and *Pterospermum acerifolium* (Hatipolia) trees.

Total lowland (on flat and low undulating terrain) rain forest in the study area is about 2000 sq km, of which about 1200 sq km are found to be favourable for the duck. In the foothills and hills, about 3500 sq km of evergreen forest occurs, where the duck is found in extremely low density.

4.4 *Ecology and Behaviour :*

4.4.1 **Seasonal status :** The WWW duck is a resident duck throughout its range (Ali & Ripley, 1983; Choudhury, 1990; Lekagul and Round, 1991). However, it is possible that it significantly moves locally depending upon water condition. In areas like Nameri WLS which is located in 'Bhabar' zone where most of the pools become dry in winter, the ducks (at least some) must seek similar biotope elsewhere. Lagoons formed along the course of the Jia-Bhareli river are also haunted in winter.

The record of a duck in Jatinga (Phukan, 1987) is intriguing. Jatinga is not part of the typical habitat of the WWW duck. nor is there any suitable waterbody nearby. In fact, the duck was caught during the 'bird-killing' nights. My observations at Jatinga suggest that the juvenile birds of the largely resident species such as the kingfishers, bitterns, green pigeons, etc., are disturbed at their roosting by high velocity south-westerly wind and the birds come towards lights for refuge (when caught or killed by the villagers). This fact is corroborated by the fact that most birds go back to their roost with the improvement of weather. The case of the WWW duck does not fall in this category.

One more factor is that many resident birds such as the kingfishers and green pigeons have now been found to migrate significantly at night, and at places like Dalton Pass in Philippines (Alonzo-Pasicolam, 1992), are attracted towards lights. The case of the WWW duck in Jatinga seems to be nearer to this category, and as such may move significantly.

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4.4.2 **Daily Activity Pattern :** WWW ducks are mostly seen at dawn and at dusk when they fly to and from roosting site and feeding/foraging site. Bulk of the reports and sightings also suggest this. Usually they use ponds and watered paddy fields in villages near forests and Forest villages, nullahs in tea gardens and large opener waterbodies at night as it is impossible during the day because of human activities. In areas where disturbance is less, the duck remains active during daytime also.

In Upper Dihing (West block) RF, I observed a lone duck floating and feeding with occasional preening from 0955 to 1300 hrs. The same duck was again observed on a different day from 0710 to 1000 hrs, this time also it was floating, feeding and foraging with occasional preening (both in October, 1993). However, it will not be appropriate to come to a conclusion as once in the same Reserved forest, I observed two family groups of three birds each (possibly 1 male and 2 females each) from 1238 to 1450 hrs with contrasting activities. While the possible drake of one group was preening on a partly submerged log, the ducks were floating around on water with frequent preening on the log near the male, the other group was roosting on a tree branch overhanging the pool.

4.4.3 **Breeding :** At Baghjan, near Dibru - Saikhowa WLS, eggs were collected in three successive years by a villager in the month of April (Choudhury, 1993a). In Upper Dihing (East block) RF also, a local collected eggs in April. Young ducklings were reported in June-July from Dangori RF (Choudhury, 1993b), Tokowani RF, Upper Dihing (West block) RF. I have observed wild caught ducklings at two localities of Upper Dihing (West block) RF. All these suggest that nesting activity begins in March. In captivity also the laying begins around latter half of March and continues till the end of June (Mackenzie and Kear, 1976).

The breeding season of the WWW duck depends upon the wet season. Examination of five nesting sites shows that during dry season (November - March), the immediate vicinity of the nesting trees remains dry. From April onwards, the water level rises to partly submerge the trees or to touch the base (of the trees). Besides food availability and increasing the area of foraging, the raised water - level which floods the tree surroundings also ensures that the ducklings fall directly on water or very near from their nest holes. At least two local villagers reported of sighting of ducklings scrambling out of nest holes and jumping down to water to join their mother.

4.4.4 **Clutch and Brood Sizes:** At Baghjan, near Dibru -Saikhowa WLS, between 1989 and 1991, three eggs were collected twice and two eggs once from a nest (same). Other egg collections recorded were of five in Dirak RF (1984), eight in Upper Dihing (East block) RF (1991), four

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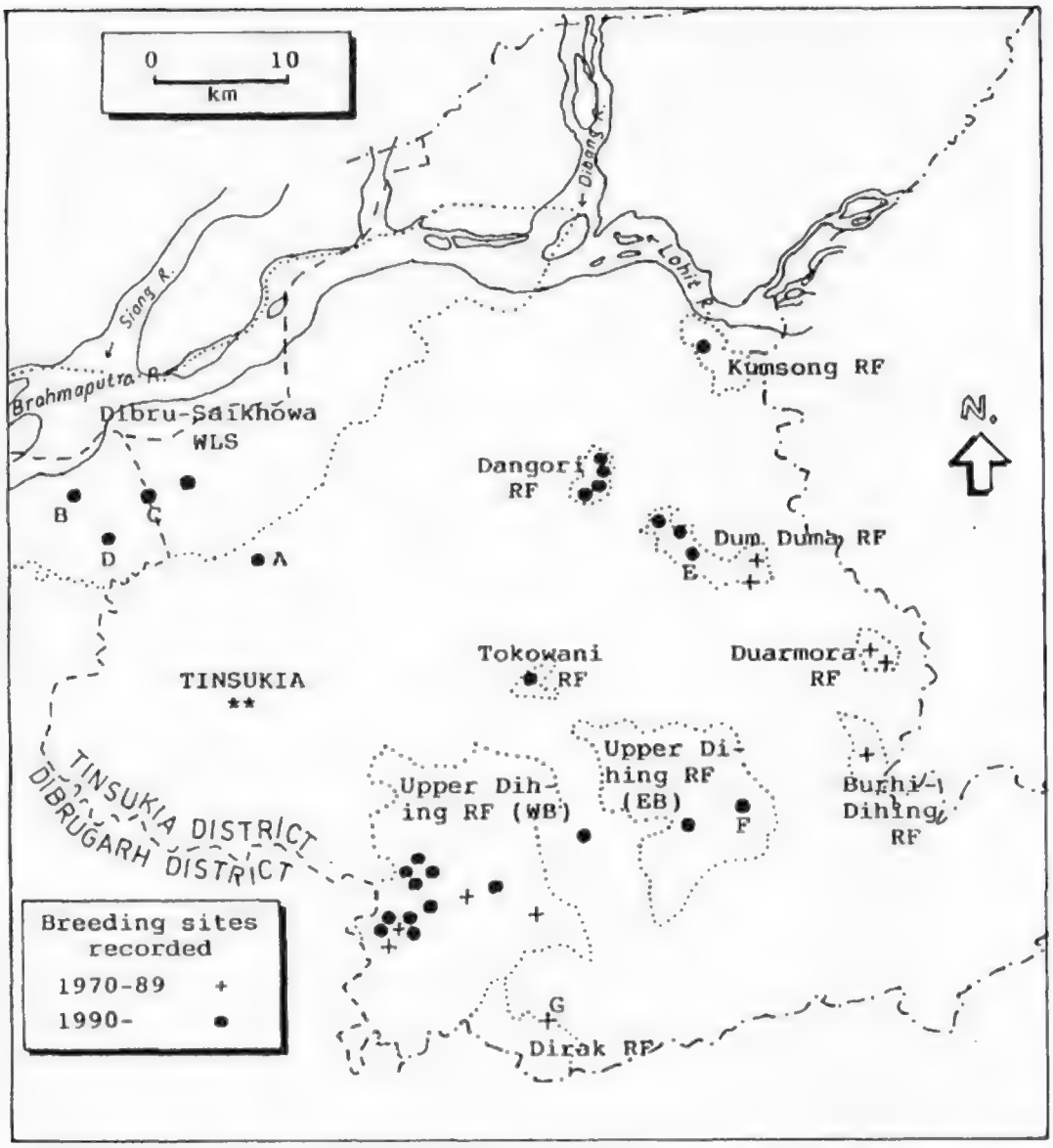

Fig 4.3 Nesting/breeding sites of the WWW duck. Those described in table 4.3 are marked (A-G).

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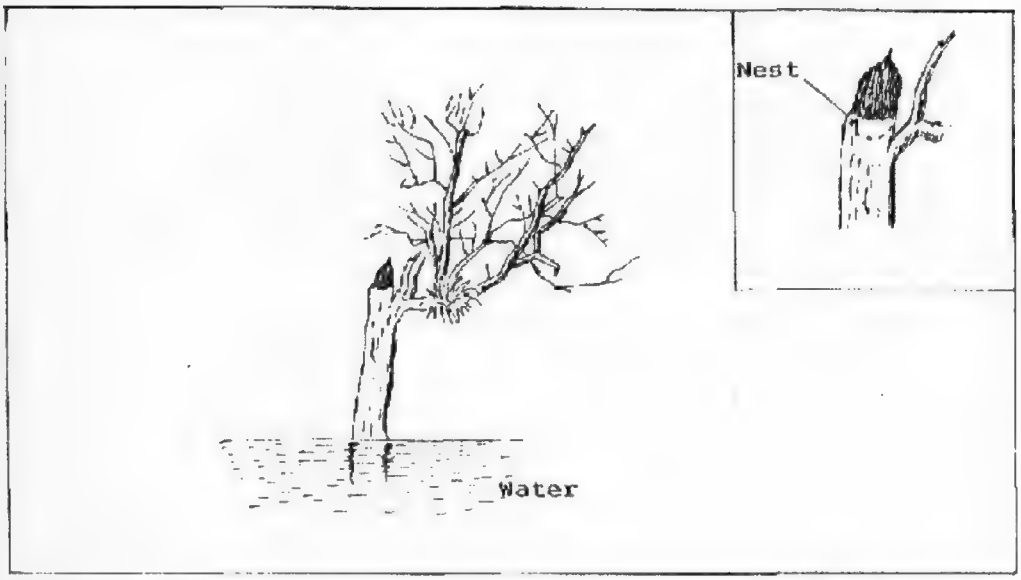

Fig 4.4 A nesting tree with nest (inset) of the WWW duck, at Baghjan. Marked A on Fig 4.3 and Table 4.3.

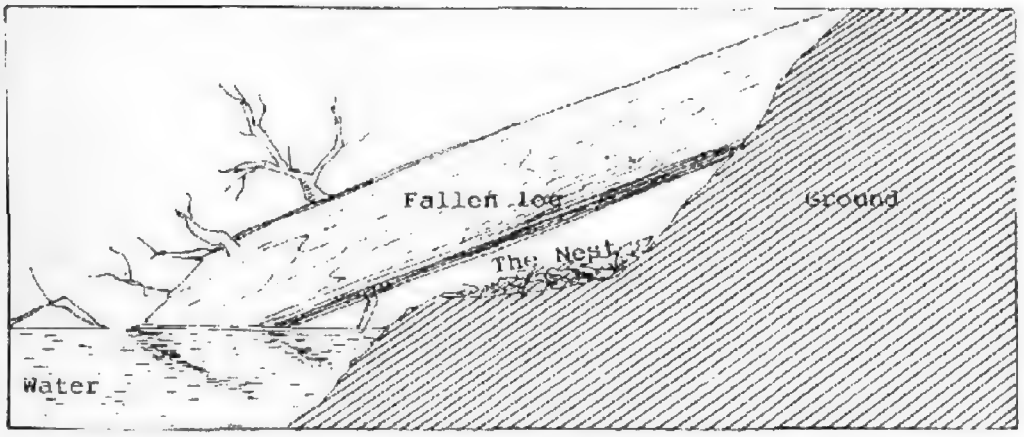

Fig 4.5 A ground nest of the WWW duck in Dirak RF. Marked G on Fig 4.3 and Table 4.3.

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(out of a clutch of eight eggs) in Kumsong RF (1989/91) and one in Dibru-Saikhowa WLS (1991).

Thirty five broods of ducklings (table 4.2), data of which could be collected ranged in size from a single to 15 with a mean of 5.23, and if the few data of egg collection is also added, then the average clutch - size comes down to 5.07. However, many of the cases of duckling collection did not comprise the entire brood, and hence, the mean clutch and brood size will be higher. Of the 35samples (table 4.2), 26 were of more than two (ducklings) while out of overall 42 samples (including egg collections), 31 were of more than two. If the collection of lone or two ducklings/eggs are excluded as extreme cases, than the average clutch - size comes to 6.26 and that of brood 6.42.

4.4.5 **Nest Sites :** During the survey, a few nesting sites were examined. The sites are listed in table 4.3. Four nests were in trees while two on the ground. In trees, the duck seemed to prefer bowl -shaped cavities that are formed on top of broken trunks (Fig 4.4). The height of the nests ranged from 6 to 7 metres above the ground.

The ground nests were recorded in Dirak RF and in Upper Dihing (East block) RF. In the former area, the nest was located beneath a large fallen log on the banks of a stream, the Lekhajan (Fig 4.5). In the latter area, the nest was amidst dense *Arundo donax* reeds. The eggs were on some flattened shorter grass surrounded by reeds. The site was in a pond, approximately 100x30 metres, and the nest was in a small island, and hence, safe from many of the terrestrial predators.

4.4.6 **Group Size and Composition :** What is the group size of the WWW duck in the wild ? A convincing answer to this question is still not available. Most of the sighting records (both past and present), except for a few instances including some of the present study, are of a few seconds only. Such extremely brief encounters are unlikely to reveal the actual picture.

I here cite an example, on 27 February, 1993, I spotted a duck (possibly female) in a jungle pool in Upper Dihing (West block) RF and recorded it as a lone bird as no other ducks were seen. After 39 minutes, one more duck (also possibly female) became visible. Then after eight minutes, a visibly larger duck (male) came out from the shady forested edge of the pool. I observed the group for another 90 minutes during which no more ducks came out. This shows how brief encounters may not reveal the actual group size of a secretive forest bird like the WWW duck.

The size of the groups observed is listed in Table 4.1 while other records are listed in Appendix I. It is seen that the size varies from two birds or pairs to seven. Sighting of lone birds are not uncommon. While

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Table 4.2 Brood size in WWW duck

Year	Locality	Ducklings reported or collected or killed
1968-71	Duarmora RF	7 -8
1968-71	Duarmora RF	*c.* 6
Mid-70s	Dum Duma RF	4
Late-70s	Upper Dihing (West block) RF	10 -15
Late-70s	Upper Dihing (West block) RF	*c.*6
Mid-80s	Upper Dihing (West block) RF	6 -7
1987-88	Upper Dihing (West block) RF	3
1984-85	Upper Dihing (West block) RF	2
1988	Dum Duma RF	8
1988	Dum Duma RF	6
1988-89	Torani RF	4
1989	Dangori RF	1
Early-90s	Upper Dihing (West block) RF	1
1991	Upper Dihing (West block) RF	6 -7
1991	Upper Dihing (West block) RF	4 -5
1991	Dum Duma RF	6
1991	Dibru - Saikhowa WLS	2
1991-92	Upper Dihing (West block) RF	2
1992	Upper Dihing (West block) RF	2
1992	Upper Dihing (West block) RF	2
1992	Upper Dihing (West block) RF	15
1992	Baghjan, near Dibru-Saikhowa WLS	3
1992	Dangori RF	2
1992	Dibru - Saikhowa WLS	4
1992	Dum Duma RF	6
1992	Dum Duma RF	6
1992	Upper Dihing (East block) RF	*c.*8
1992	Upper Dihing (West block) RF	2
1992-93	Digboi town	12
1993	Upper Dihing (West block) RF	3
1993	Upper Dihing (West block) RF	4
1993	Upper Dihing (West block) RF	*c.*8
1993	Upper Dihing (West block) RF	8 -10
1993	Tokowani RF	4 - 5
1995	Dangori RF	4

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Table 4.3 Nesting data of *Cairina scutulata*, all from Tinsukia District.

Locality	Tree species	Tree height	Nest height	Nesting cavity,etc.	Terrain	Location code for map (Fig 4.3)
Kochuoni pathar, Baghjan, outside Dibru- Saikhowa	*Salix tetrasperma* (Bher)	7m	7m	Bowl-shaped cavity on top of a broken tree-trunk (Fig 4.4)	Floodplain	A
Pani - kauri pathar, Dibru-Saikhowa WLS	*Bischofia javanica* (Uriam)	—	—	Bowl-shaped cavity on top of a broken tree-trunk.	Floodplain	B
Near Kolomy tinali, Dibru-Saikhowa WLS	*Bischofia javanica* (Uriam)	*c.*12m	*c.*7m	Possibly in the dense tangled vines, etc.	Floodplain	C
Mora Dolki, Dibru-Saikhowa WLS	*Pterospermum acerifolium* (Hatipolia)	—	—	Cavity on top of a broken tree-trunk	Floodplain	D
Sookerating Nullah, Dum Duma RF	*Albizzia* sp (Moz)	*c.* 6m	*c.*6m	Cavity on top of a broken tree-trunk	Plains, above flood -level	E
Between Pengeri-gate and Khatangpani, Upper Dihing (East Block) RF	On the ground	—	—	Among *Arundo donax* (Nal) reeds surrounded by water	Undulating plains	F
Lekhajan, Dirak RF	On the ground	—	—	Beneath a big fallen log on stream-bank.	Undulating Plains	G

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two birds are mostly pairs, in case of three birds, the sex ratio is found to be 1:2. Perhaps one male and two females is the 'ideal' group size. Because of frequent human interference like hunting, etc., and absence of female for most of the time during breeding season, chances of sighting of pairs are more. All my records of three adult ducks were in non - breeding season in relatively less disturbed habitats. Moreover, most of the 'long' observations, from more than six hours in Dum Duma RF to more than two hours in Upper Dihing (West block) RF revealed three ducks.

The largest family group observed by me was of seven ducks, in Dangori RF. I observed the group twice, in the evening of 15 November, 1995, and in the morning of 16 November, 1995. The group consisted of three adults and four immature ducks. Of the three adults, one was male while the remaining two were in all probability females. The young birds were only marginally smaller than the adult females but had very dark, almost blackish, head. The family group was observed to roost and forage as a close - knit single unit.

Loose association of more than 10 ducks are occasionally met with. I have observed such a group of 14 ducks in the evening of 15 November, 1995, in Dangori RF. The association consisted of two groups of ducks numbering seven and four, a lone duck, and two more ducks. The groups of seven and four, and the lone duck roosted in the same tree (trees, as the canopy of two trees were joined together), while the other two in two different trees, some distance (about 250 metres) away. The last two ducks were heard calling from two different trees at dusk and hence,actual group size could not be ascertained (could be higher also).

Other such associations recorded were of 12 ducks roosting in a *Ficus* tree at about 3.00 pm of 28 March, 1993, in Dum Duma RF (Keshab Baruah, pers. comm). In Dibru - Saikhowa WLS, 11 ducks were seen in December, 1994 (Asif Hazarika, pers. comm.) The site was towards north -west of Hatighuli.

4.4.7 **Vocalisation :** The WWW duck has a honking call which they give while in flight, when flushed and when alarmed even if it is stationary. However, some birds in flight or when flushed were also observed to be silent. The honk resembles some fluty sounds. However, the most remarkable call I have heard was of three birds that flew over the Dum Duma river on 10 December, 1992. They uttered a very loud *Kee-a , Kee - a*, while flying towards daytime roost at about 7 .22 am. They continued the call till they noticed us only about 30 meters below (measured from nearest tree - height by the side of which they flew). Then some of them produced a few quacks which resembled domestic duck (female).

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4.4.8 **Natural Predation :** No natural predation could be observed. However, monitor lizards (*Varanus bengalensis* and *V. salvator*), known for their likeness for eggs and birds, were observed by me in most of the pools. Birds of prey observed in the wood duck habitat included the Black crested baza (*Aviceda leuphotes*), Bonelli's eagle (*Hieraaetus fasciatus*), Pallas's fish eagle (*Haliaeetus leucoryphus*), Greyheaded fish eagle (*Icthyophaga ichthyaetus*) and the Crested serpent eagle (*Spilornis cheela*).

4.4.9 **Moulting :** I could not observe any duck in moult. However, a few instances of catching of live 'flightless' ducks have been found. In late 1970s, a duck in moult was seen in Pawoi nadi in Upper Dihing RF (West block). About six ducklings were also seen, one of which was caught (Gabrel, pers comm.). In June - July, 1993, as many as three adult ducks were caught by some ex - tea garden labourers with the help of trained dogs in Choraipung area of Upper Dihing RF (West block). None of these ducks could fly suggesting that they were in moult. In 1984, an adult duck nesting on the ground was found to be unable to fly (Gabrel, pers. comm).

4.4.10 **Flight :** The WWW duck is a strong flier. It flies with slow wing beat and usually remain at or below the canopy level. Inside forest, they follow nullah or river courses as their flight path. While they were observed to fly away directly on a few occasions, in many cases, they circle overhead before flying away. This peculiar behaviour makes them vulnerable to an experienced shooter. In all, the group flights (more than three birds ; 5 samples), the male birds have been observed to take the lead. In a flight of three birds, I found them in a rough 'V' pattern while in a group of seven, I saw the ducks flying in a 'line', i.e., a single file.

4.5 *Population Density and Estimate* :

Although determination of accurate population density of a shy and secretive bird like the WWW duck is very difficult, the available data gives some generalised idea. In 919 heet (800 heet favourable habitat) Dangori RF, I observed 14 ducks at a time. In 2880 heet (2800 heet favourable) Dum Duma RF, 12 ducks were seen at a time at the start of the breeding season. These are unlikely to be the total population. However, for a safer estimate, we may treat these as the known population for those areas. The density comes to one bird per 57 heet and 233 heet in Dangori and Dum Duma RFs respectively. However, for making an overall assessment, and to avoid over-estimate, the density of Dum Duma RF can be applied for some of the forests of Tinsukia, Dibrugarh, Lohit. Changlang and Tirap districts having similar habitat and terrain to have an idea of the abundance of the duck (details in table 4.5). The density for

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Table 4.4
Some instances of Hunting, Trapping, and Collection of eggs and ducklings recorded during the field study (number of eggs or ducklings).

Year	Hunting[1]	Trapping[2]	Egg collection	Duckling collection	Total
1968-71	—	—	—	6	6
Early '70s	—	—	—	4	4
Late '70s	1	—	—	4-5	5-6
1982	—	1	—	—	1
1984	—	1	5	—	6
1984-85	2	—	—	—	2
1987-88	—	—	—	3	3
1988-89	—	—	—	4	4
1989	—	—	3	—	3
1990	2	—	2	—	4
1990-1993	—	10-12*	1	—	11-13
1991	7-8	—	16+	4	27-28 (+)
1992	2	2	—	32	36
1992-93	1	—	—	4	5
1993	7	3	—	9+	19+
	22-23	17-19	27+	70-71 (+)	136-140 (+)

Areawise break-up. *Assam* : Upper Dihing (WB) RF = 43-44 ; Upper Dihing (EB) RF= 28-30; Dum Duma RF =16 ; Dibru-Saikhowa WLS & adjacent areas= 15; Dirak RF = 6 ; Duarmora RF =6 ; Katakhal RF =4-5 ; Torani RF =4 ; Kumsong RF =4 ; Digboi town = 4. *Arunachal Pradesh :* Dibang RF = 3 ; Namsangmukh VRF =1 ; Near Longding, Tirap =1.

[1] By fire -arms, traditional weapons and trained dogs.

[2] With traditional snare and also catching by hand (ducks in moult !).

* Trapped by a single person within a span of three years.

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the hilly areas like Namdapha, Mehao, Patkai, etc., could not be worked out at present due to lack of sufficient data.

From the table (4.5), it appears that the highest population of the WWW duck is in Upper Dihing (West block) RF followed by Dibru - Saikhowa WLS and Upper Dihing (East block) RF. The total estimated population for Tinsukia and Dibrugarh comes to 291, which covers almost the entire probable population of these areas. In Arunachal Pradesh, an estimated 59 ducks are in the lowland forests of Lohit, Changlang and Tirap districts. This is excluding the large hilly tracts of Namdapha and other areas where an unspecified number of ducks are found although at a much lower density.

The table also shows that the estimated population is higher than believed earlier (Pirie & Choudhury, 1976; Green, 1992). In all the earlier reports, two very important areas, i.e., Upper Dihing (East and West blocks) RFs have not been given due coverage.

More than 30 nesting sites, both old and new, could be identified during the survey. These includes actual nesting trees (wherever located) and the sites of collection of ducklings (trees could not be located) by the villagers. Although these locations form only a fraction of the probable total, it indicates that the minimum breeding population in Upper Dihing (East and West blocks) RFs, Dum Duma RF, Dangori RF, Dibru - Saikhowa WLS and some other pockets in Tinsukia district alone have more than a hundred breeding population with some more in Namdapha, and outside the present study area (e.g. Nameri WLS, Nambor RFs, etc.).

4.6 *Conservation Problems*

4.6.1 **Habitat Destruction :** Habitat destruction by men has threatened the survival of the WWW duck not only in the study area but throughout its range. Since the bird is basically a forest - dweller, its survival depends upon the continued existence of the forest cover.

The main reasons for which the rain forests of the study area are destroyed are expansion of agriculture and tea - plantation in the flat terrain (eg., Tinsukia), *jhum* or slash-and-burn shifting cultivation of the hill tribes (eg., Patkai Range), monoculture forest plantation (which deprives the duck of its favourite roosting and nesting trees), commercial exploitation of timber, demand for fuel wood and various developmental activities like construction of roads and installation of oil rigs inside forests.

The 'Forest villages', which are in most of the larger reserved forests, are now expanding illegally due to increase of population. Laika and

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Table 4.5. Population estimate of the WWW Duck in some of the forests of Upper Assam and Arunachal Pradesh (Base : Dum Duma RF ; Density : one duck per 233 hect).

Name of the RF/ Forest	Total Area in Hect.	Ideal Habitat (approx).	Estimated Population
Assam			
1. Dum Duma RF	2880	2800	12
2. Dibru-Saikhowa WLS	c.64000	11500	50
3. Upper Dihing (WB) RF	27500	20000	90
4. Upper Dihing (EB) RF	13200	9000	39
5. Kakojan RF	2319	2000	9
6. Kundil Kaliya RF	7280	2000	9
7. Dirak RF	3040	2000	9
8. Tinkopani RF	3030	2000	9
9. Torani RF	2040	1500	6
10. Burhi-Dihing RFs	2295	1500	6
11. Namphai RF	2100	1500	6
12. Kumsong RF	2250	1100	5
13. Dangori RF	919	800	4*
14. Sadiya Station (NB) RF	2330	500	2
15. Hahkhati RF	671	400	2
16. Mesaki RF	1366	500	2
17. Phillobari RF	314	300	2
18. Kukuramora RF	365	300	2
19. Duarmora RF	653	500	2
20. Kotha RF	1130	400	2
21. Digboi (WB) RF	1100	500	2
22. Tokowani RF	497	350	2
23. Joypur RF (Dibrugarh)	10870	4500	19
Arunachal Pradesh			
1. Namphuk RF	5720	2500	10
2. Namsang RF	10888	3000	13
3. Namchik RF	4982	3000	13
4. Namsai RF	2374	800	3
5. Noa-Dihing RF	1117	500	2
6. Other Reserved and Unclassed lowl and forests of Lohit & Changlang districts	12000 (approx)	4000	18

Total : 291 for Tinsukia and Dibrugarh (almost the entire population); 59 for part of Lohit, Changlang and Tirap (part populaton).

* 14 sighted by me at a time :

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Dadhia is Dibru-Saikhowa WLS, Lakhipathar, Choraipung, Borjan, Balijan, Borbil and Dimoruhola in Upper Dihing (West block) RF, and Kherjan, Bhimpora-pathar, and Dhekiajan in Upper Dihing (East block) RF are the large Forest villages inside the prime habitat of the WWW duck.

Selective felling of old and mature trees is a serious threat to the breeding of the duck. In smaller forest pockets like Duarmora, Phillobari and Tokowani RFs, cutting down of trees for fuel wood is also detrimental.

The ultimate cause of forest destruction is, however, the very rapid growth of human population.

4.6.2 **Hunting and Poaching :** Hunting with guns and bow-and-arrow, trapping with traditional snares, and collection of eggs and ducklings are important factors for the decline of the WWW duck in the study area. Some such instances recorded during field study are placed is table 4.4.

Most of the hunting and collection of eggs and ducklings go unreported. The data placed in table 4.4 represents only a fraction of what actually happened in the field. However, it clearly indicates that collection of ducklings is the single most serious threat (50% of the total birds destroyed/collected.). Collection of eggs and ducklings combined accounts for as high as 71%. With a dense human population around, the defenceless ducklings (easy to catch once spotted) have no other way unless some areas are declared protected and an awareness campaign is launched.

The table 4.4 also shows the magnitude of destruction of birds through hunting, trapping and catching, which may not be large (numerically) but for a critically endangered species like the WWW duck, it is quite significant as it may eliminate the species from smaller pockets.

In some tribal areas of Lohit , Changlang and Tirap districts, hunting is an important factor for the decline of the duck because almost every house-hold has fire-arms, especially self-made muzzle-loaders.

Many of the cases of hunting, trapping and collection (of ducklings) are not intentional. In Tinsukia district, except for one trapper (who snared 10 -12 ducks in three years), most were unintentional, sometimes entangled in fishing net or falling to wood-cutters or hunters pursuing deer.

4.6.3 **Pollution and Pesticide:** In the WWW duck areas of Tinsukia and Dibrugarh (also elsewhere outside the study area), pesticides like Dieldrin,DDT and even dangerous non- biodegradable Thiodan are widely

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used in the tea plantations. The drains and ponds inside such plantations are often used by the ducks. Many of the pools and drains are also used for dumping tea wastes. Oil drilling, seepages from oil rigs, and the refuse ponds near the rigs are causing severe pollution in areas like the Upper Dihing RFs (both East and West blocks). Digboi Refinery is also a matter of concern (e.g. pollution in the Tel nala , upper reaches of Digboi river).

4.6.4 **Other Disturbances :** In most of the primary habitat of the WWW duck, the channels and pools are regularly haunted by the fringe villagers for fishing. As a result, the ducks foraging, resting/preening on logs, or floating on water are disturbed. In fact, most of the ducklings are caught by such fishermen (some by wood-cutters also). In Dibru-Saikhowa WLS also, during the wet season, fishermen with their canoes and boats move deep inside the forest.

4.7 Captive Breeding :

In view of the critical status of the duck in the wild, a captive breeding centre was established at Bordubi TE in Tinsukia district in 1975 under the aegis of Assam Valley Wildlife Society. This society consists chiefly of tea-planters and tea - officials. Since then more than 60 birds had been raised to maturity. The breeding records since 1986 are placed in table 4.6. I visited the centre in 1989 and found 12 adult males, 20 adult females and 17 ducklings (total = 49). In early 1993, there were only 15 adults and a lone duckling. I also paid a visit in 1993.

In 1991, the society set up a second aviary at Namdang TE, also in Tinsukia district. The ducks were brought from Bordubi aviary. Two males and four females were kept in two enclosures (one male and two females each).

Table 4.6 **Breeding records of Bordubi and Namdang centres since 1986 (Source : Assam Valley Wildlife Society)**

Years	Eggs Laid	Hatched	Survived	% of Survival
1986	10	4	4	40.0
1987	33	11	10	30.3
1988	42	15	11	26.2
1989	39	16	12	30.8
1990	39	20	11	28.2
1991*	43	9	6	14.0
1992*	64	13	9	14.1
	270	88	63	23.3

*Both Bordubi and Namdang.

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Original intention of the captive breeding was to breed, raise and release the birds in the wild. However, an analysis of the breeding record and the rate of mortality shows that with the present system, such possibility is a very remote one. The table clearly shows the state of affairs. Only 23.3 per cent survived that too only to die of Avian tuberculosis afterwards. The captive breeding, as undertaken here was a complete failure and any attempt to start it again would mean loss of precious lives.

Most of the ducks and ducklings were infected with Avian Tuberculosis. Post mortem reports of most of the cases also confirmed it. In 1991 and 1992, at least seven ducks died in Namdang centre alone, of which five died of Avian TB, one Mycotoxicosis and one having both. In 1993, in just one month (October), two died of Avian TB at Namdang.

Another major problem faced by the centres was inbreeding as most of the ducks were descendants of a few original stock. This is, perhaps, the main reason for the large number of infertile eggs and also high infant mortality.

Since the ultimate aim was to release the ducks to the wild, there was no justification of prolonged use of medicines like Hostocycline, an antibiotic which also causes lowering of immunity. Moreover, with the decrease of immunity, the ducks and ducklings became prone to other infections.

The ducks were kept in enclosures which were more of a zoo-type for exhibition rather than for future release in the wild. At Bordubi, there were seven enclosures, each measuring 70 ft (length) x 30 ft (breadth) x 10 ft (height), while at Namdang, two enclosures measured 33 ft x 16 ft x 10 ft. For a large duck like the WWWduck, the enclosures were too small.There were also instances when a few ducks died because of accidental consumption of iron pegs, pellets, etc, inside the enclosure (R. Bhattacharjee, DFO, pers comm.).

Most of the birds which were alive during my visits were also suspected to be infected with Avian TB. Hence, those could not be released in the wild as that would have infected the wild population.

Attempts had also been made at Guwahati Zoo for breeding but without success. At Miao Zoo, near Namdapha in Arunachal Pradesh, a captive breeding centre has been established. In July, 1989, I saw a duck and a duckling. In August, 1993, seven adults and nine immatures (all born in captivity) were seen.

There are innumerable instances where eggs and ducklings collected by villagers had survived very well. Many such ducks fly away to jungle

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after reaching adulthood, some, however, are either sold in local markets or consumed by the owner. On 22 August, 1993, I came across such a duck (3-4 months old) in a Forest village at the edge of Upper Dihing (West block) RF. The duck seemed to be well at home with its domestic counterparts, floating, preening and foraging with them. I again visited the site on 25 October, 1993. This time the duck looked slightly larger and was receptive to the call *aah -aah* of its owner's family members. Since 23 October, the duck spent the night inside jungle coming back to the village in the morning. While the owner gave it paddy and occasionaly cooked rice, it used to feed /forage throughout the day in nearby pools with the domestic ducks. This also enabled it to have the food of its choice and also to perch on logs, branches, etc (which were lacking in the aviaries of Bordubi and Namdang).

5 THE BENGAL FLORICAN

5.1 *Field Characteristics :*

The male florican has black plumage with buffy- brown mottled upperparts. Head crested while a bunch of elongated plumes overhangs the breast. Wings almost pure white. In flight, unmistakable with black body and white wings.

The females are slightly larger than the males and are mottled buff and brown with black marks. Lack white on wings. The immature males also resemble female creating lot of problem in sexing the birds in the field.

The Bengal florican is a bustard with long bare legs. In size, it is larger than domestic fowl.

5.2 *Distribution :*

The Bengal florican has been observed in Amarpur sector of Dibru-Saikhowa WLS in Tinsukia district, and in Dibang RF of Dibang Valley district. The presence of the bird had been confirmed in Churke chapori (in Dibru - Saikhowa) and Sibia chapori of Tinsukia,and in Bhim Chapori in the Lohit river of Tinsukia and Lohit districts, in the chapories of the Lohit river between Sunpura and Tezu in Lohit district, and in many localities of Dibang RF, especially near Anpun, and Bijari.

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Elsewhere, the florican has been recorded in Kobo chapori of Dhemaji district and D'Ering WLS of East Siang district. Both the areas lie outside the study area. Potential habitats were found in Mohmora and Koplong chapories of Dibru-Saikhowa WLS and Kundil Kaliya RF of Sadiya (Fig 5.1).

Localities of direct field observations are listed in Table 5.1, while all other records including past ones and reports are listed in Appendix II.

5.3 *Habitat :*

The Bengal florican affects wet savannah grassland, usually dominated by *Imperata cylindrica* (Ulu) and *Saccharum* spp (Kher). They have been observed in tall grassland dominated by *Arundo donax* (Nal) reed in Amarpur area of Dibru-Saikhowa WLS. In Dibang RF, the floricans have been observed in grasslands dominated by *Imperata cylindrica* and various mixed species.

The floricans also often haunt the paddyfields fringing the grasslands, as recorded near Mingmung , Gohpur, etc., areas of Amarpur.

Near Laimekuri in Amarpur, the floricans were observed in a patch of clearing surrounded by tall grass and reed and was visible from a foot track, not very far from human settlement. Of course, the birds were inside a fenced area (maintained by the Soil Conservation department) where the habitat was relatively safe.

Near Bomjir, in Dibang RF, the floricans were observed near a buffalo-*khuti* (cattle-camp).

The localities in Tinsukia and Dibang Valley districts where the floricans have been recorded are between 100 and 140 metre elevation. All the areas are on flat plains being on the floodplains of the Brahmaputra, Siang, Dibang and the Lohit rivers. Bulk of the habitat reels under water during monsoon, varying from a few days to more than a month.

Total grassland in the study area is about 350 sq km, of which some 180 sq km have been found to be favourable for the floricans. With D'Ering WLS, Kobo chapori and adjacent areas, the total grassland area comes to about 550 sq km with about 300 sq. km forming favourable habitat for the floricans.

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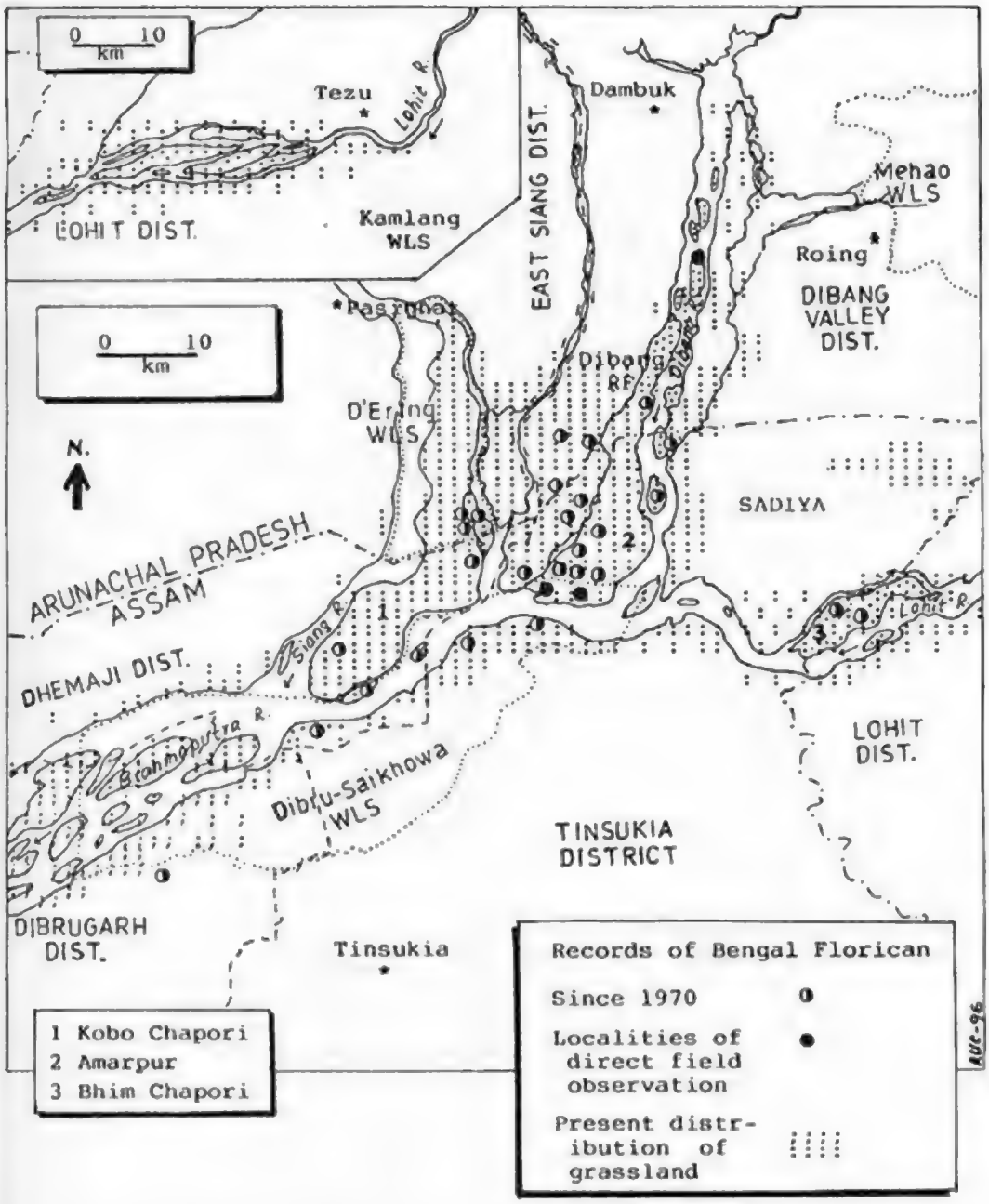

Fig 5.1 Recorded localities, distribution and habitat of the Bengal Florican in the study area.

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Table 5.1 Direct field observations of the Bengal florican in Tinsukia and Dibang Valley districts

Date	Location	Coordinates	No. of Birds	Remarks/Note
9 February, 1993	Amarpur, Dibru-Saikhowa WLS, Tinsukia dist.	27°50 ′ N, 95°31 ′ E,	2	In female plumage. The birds were in a small opening amidst tall grass dominated by *Arundo donax* reed near Laimekuri. Time: 2:56 - 3:06 pm.
8 March, 1993	Near Bomjir, Dibang RF, Dibang Valley dist.	28°07 ′ N, 95°42 ′ E.	3	Three lone birds in the chapori of the Dibang river. One male and two females flushed from grass. Time : 4:05-4:20 pm.
22 December. 1993	Amarpur, Dibru-Saikhowa WLS, Tinsukia dist	27°50 ′ N, 95°33 ′ E.	1	A lone male in flight near Lalbeel, on the grassy banks of the Lohit - Dibang rivers. Time : 08 :30 am.

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5.4 *Ecology and Behaviour :*

5.4.1 **Seasonal status :** The Bengal florican is a resident species (Ali & Ripley, 1983) with possible seasonal local movement (Rahmani *et al,* 1990). In Cambodia and Vietnam, recorded mostly in winter (King *et al,* 1975) suggesting a seasonal movement.

Most of the grasslands of the study area are prone to monsoon flooding which may continue for a few days (upper areas) to more than a month (lower areas). This regular annual feature suggests that the floricans move locally to slightly higher grounds when areas such as Churke and Amarpur reels under water.

5.4.2 **Group Size and Composition :** The Bengal florican is seen solitary, or in loose groups of upto eight birds (Ali & Ripley, 1983). Of the total six birds sighted during the survey, four were lone birds, and two seen together. Of the lone birds, two were in male plumage. All the remaining, including two sighted together, were in female plumage.

5.4.3 **Vocalisation :** The two birds observed in Amarpur on 9 February, 1993, uttered a shrill *whee -whee* while flying away. The birds went behind a clump of tall grass when I tried to photograph them. They remained behind the grass till I was about 10-15 metres away. The birds then suddenly took off with several shrill notes before vanishing among the tall reeds and grass.

5.5 *Population Density and Estimate :*

Like the WWW duck, the Bengal florican is also a difficult bird to observe and estimating its population and density is equally difficult. However, an attempt has been made to make a rough assessment by conducting estimates in some small select plots in Churke chapori, Amarpur, Dibang RF, and in the chapories of the Lohit river. In about 20.0 sq km of sampled plots, 6 floricans were found suggesting a crude density of one bird per 333 hectares.

From table 5.2, it appears that the Dibang RF has the maximum floricans. The total populations is estimated at around 54 -70 birds in the entire study area with 36-45 more in Kobo chapori, D'Ering WLS and adjacent areas.

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Table 5.2
Population estimate of the Bengal Florican in some areas of Upper Assam and Arunachal Pradesh (Base : Density of one florican per 333 hect).

Name of the RF/ Area	Total Grassland (approx) in Hect.	Ideal for Florican (approx).	Estimated Population
<u>Assam</u>			
1. Dibru-Saikhowa WLS (excluding Amarpur but including the chapories of the Brahmaputra and the Lohit rivers)	7000	3000	9-12
2. Amarpur and Sibia chapories	7000	3000	9-12
3. Sadiya (including Kundil Kaliya RF, Ambikapur and Bhim chapori)	3000	2000	6-8
4. Kobo Chapori	8000	4000	12-15
<u>Arunachal Pradesh</u>			
1. Dibang RF	8000	6000	18-22
2. Deopani and Kerim RFs	2000	1000	3-4
3. Chapories of the Lohit river	8000	3000	9-12
4. Between Sesseri and Sibia rivers	3000	2000	6-8
5. D'Ering WLS	9000	6000	18-22

Total : 36-47 for Tinsukia, Dibrugarh and Dhemaji of Assam; 54-68 for East Siang, Dibang Valley and Lohit of Arunachal Pradesh.

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5.6 *Conservation Problems :*

5.6.1. **Habitat destruction :** The Bengal florican inhabits grasslands in the alluvial plains which are suitable for cultivation. Hence, there is constant threat from encroachers throughout its range. Since the bird is restricted to the grasslands, its survival depends upon the continued existence of the large tracts of grass.

Large areas of grassland have been cleared during the last decades for cultivation and settlement. In areas, such as Amarpur, especially from Mingmung to Gohpur, the wet paddy cultivation is practised in what was grassland earlier. In other areas, seasonal winter crops, such as mustard are grown. Every year, a few hectares are being added from the grassland.

Other major reasons for which the grassland habitats are being destroyed are commerical exploitation of thatch grass (for use as building material), tree plantation by the Forest and Soil Conservation departments and grazing by domestic buffalo and cattle. A large number of *khuties* (*khuti* = cattle camp) are scattered all over the grassland areas. In heavily grazed areas, such as Sibia chapori, hardly any cover is left for a large bird like the florican.

New settlements are coming up in Kobo chapori, Amarpur and Dibang RF by clearing the grasslands.

5.6.2 **Hunting and poaching :** There were a few instances of hunting with guns, trapping with traditional snares, and killing by hitting with long stick.

5.6.3 **Others :** Because of large number of grazing cattle and buffalo in the grasslands, there is possibility of serious disturbance during breeding. Eggs and Chicks may get trampled by the grazing herds. Systematic burning is not practised in most of the grasslands of the study area, and hence, shrubs and thickets are coming up at places.

6 CONCLUSION

6.1 This is the first detailed survey of the WWW duck carried out in the area.

For the Bengal florican, the study area is a newly surveyed one. Information on the species in the area have become available after a long gap since Hume and Marshall (1880) and Baker (1921).

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6.2 The survey revealed that the population of the WWW duck is more than the earlier estimates. Green (1992), on the basis of local reports, had estimated 65 ducks for India of which 45 in Dibrugarh (including Tinsukia).

The present survey indicates that more than 290 ducks are found in Tinsukia and Dibrugarh districts with 59 in some areas of Arunachal Pradesh. With the population of Nameri WLS (Das, 1995) and other pockets of Assam, Arunachal Pradesh and other north-eastern states, the total Indian population is likely to be more than 400.

The survey also revealed that a significant population of about a hundred Bengal floricans are still found in this part of north-eastern India.

6.3 Although the present survey suggested that the wild population of the WWW duck is higher than the earlier estimates and also added some to the known population of the Bengal florican, both are still critically endangered. Their wild population are declining and habitat shrinking.

6.4 The study has identified that Upper Dihing (West and East blocks) RFs are among the most important sites for the WWW duck, while the Dibang RF is a key site for the Bengal florican.

6.5 The WWW duck perhaps no longer exists in Sadiya Station and Kukuramora RFs of Sadiya.

6.6 The evergreen forest on flat terrain seemed to be the most favoured habitat of the WWW duck.

6.7 In less disturbed areas, the WWW duck has been found to be active during day-time and also under direct sun-ray.

6.8 More than 30 nesting sites of the WWW duck, both old and new, have been discovered.

6.9 Ground nesting by the WWW duck have been recorded for the first time.

6.10 The group size of the WWW duck is found to be a pair or one male and two females. Larger groups are either immature birds with parents or loose association of two or more groups (during foraging or roosting).

6.11 Observation of 14 (may be one or two more) at a time is a new record. Earlier reliable record of largest 'group' was of 11 ducks (Parsons,1940).

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6.12 Habitat destruction continues to be the major threat to the survival of the WWW duck as well as the Bengal florican.

6.13 Collection of live ducklings of the WWW duck by villagers, etc., is also a major threat.

7 RECOMMENDATIONS

7.1 *New Protected Areas :*

The following areas have been recommended for immediate declaration as National Park and Wildlife Sanctuary.

7.1.1 **UPPER DIHING NATIONAL PARK :** In Tinsukia and Dibrugarh districts of Assam. To cover Upper Dihing (West block) RF (part), Joypur RF (whole) and Dirak RF (whole) (Fig 7.1). The remaining areas of Upper Dihing (West block) RF, excluding the Forest villages, may be treated as buffer zone. The main justifications for declaring the area as a National Park are :

(i) This area has the maximum estimated population of the WWW duck (more than 100) for any protected/proposed protected area.

(ii) This is the largest contiguous rain -forest area left in the whole of Brahmaputra Valley.

(iii) The Upper Dihing has a long history of protection and management as a Reserved Forest and it was notified more than a hundred years back, in 1888.

(iv) The area is rich is other wildlife also. Wild elephant (100 to 200), tiger, leopard, clouded leopard, gaur (rare), sambar, dhole or wild dog, hoolock gibbon, capped langur, possible silvered leaf monkey, stump-tailed macaque, pig-tailed macaque, rhesus macaque, Assamese macaque, slow loris, giant flying squirrel, Malayan giant squirrel, different species of hornbills, peacock-pheasant, kaleej pheasant, etc., are found. Recommended earlier also (Choudhury, 1989),

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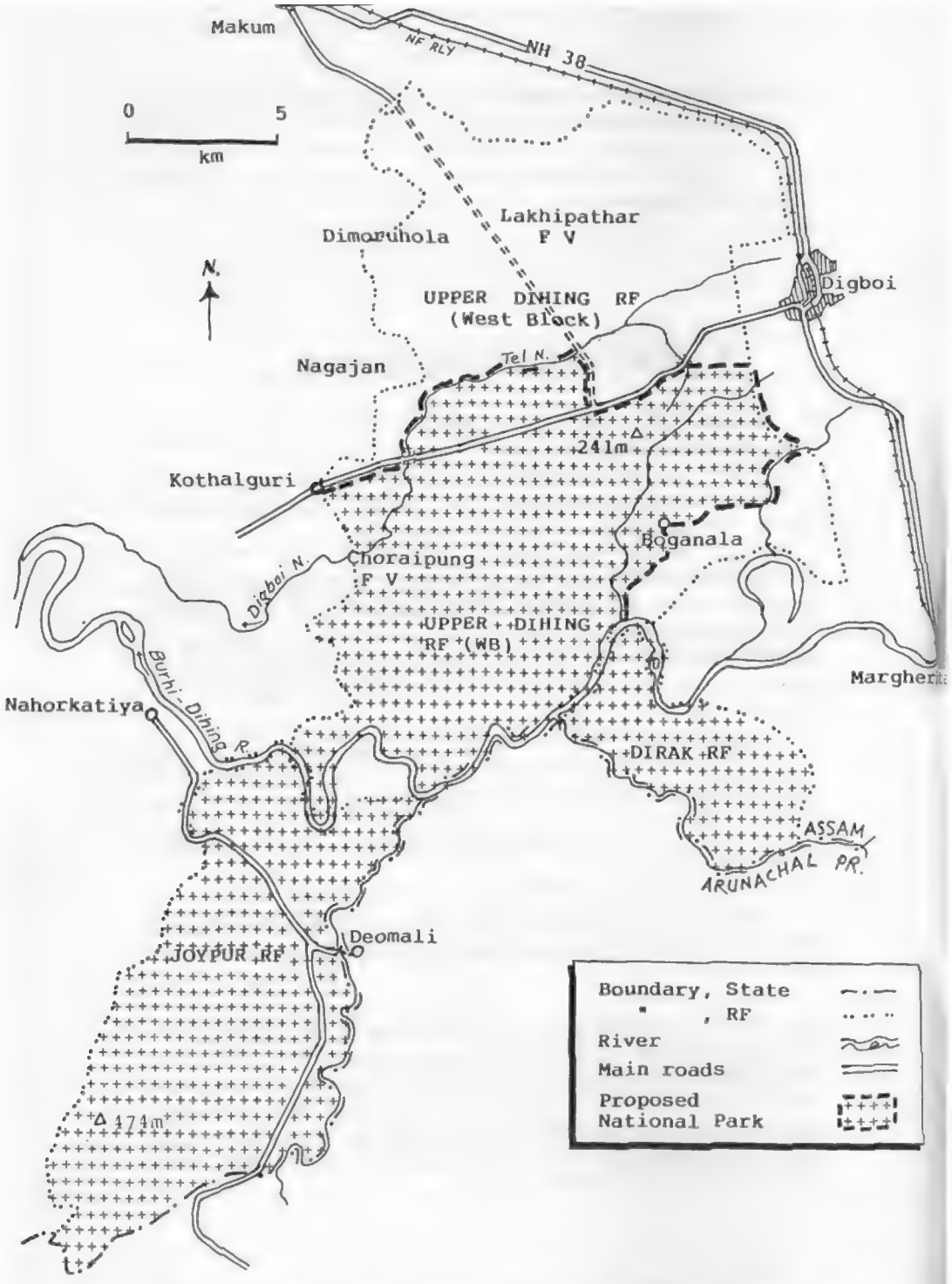

Fig 7.1 Map of the proposed Upper Dihing National Park

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The schedule of the proposed National Park is as follows :

(A) *Location :*

District (civil)	:—Tinsukia and Dibrugarh.
Sub-Division (civil)	:—Margherita and Dibrugarh.
Forest Division	:—Digboi and Dibrugarh.
Area	:—267.0 sq km. (Upper Dihing RF — 128.0 sq km; Joypur RF—109.0 sq km; Dirak RF—30.0sq km)

(B) *Boundary description:*

North :— From near Kothalguri Gate in the west through Digboi-Duliajan road upto Digboi nadi, then follows the river upstream (called Tel nala) upto the Forest road connecting Makum with Digboi-Duliajan road, then again follows Digboi-Duliajan road upto Balijan nala. From Balijan bridge straight line towards east upto the boundary of Digboi (West block) RF.

East :— From the point where straight-line from Balijan bridge touches the boundary of the Digboi (West block) RF, follows the existing eastern boundary of Upper Dihing (West block) RF upto Pawoi nadi, then follows Pawoi nadi downstream upto the bridge (over Pawoi nadi) on the main Forest road. Then follows the road towards west upto old Boganala camp, then follows the abandoned trolley-line through south and south-west upto Janglu nadi, then follows Janglu nadi upto its confluence with the Burhi-Dihing river. Then the boundary follows the existing north-eastern and eastern boundary of Dirak RF upto Assam-Arunachal Pradesh interstate border.

South :—From south-eastern tip of Dirak RF follows the interstate boundary upto the south-western tip of Joypur RF.

West:—From south-western tip of Joypur RF follows the existing western boundary of the Joypur RF upto the Burhi-Dihing river, then follows the existing western boundary of Upper Dihing (West block) RF upto Kothalguri Gate on Digboi-Duliajan road. The notified area of Choraipung F.V. is excluded from the area.

7.1.2 **DUM DUMA—DANGORI WILDLIFE SANCTUARY :** In Tinsukia district of Assam. To cover the entire Dum Duma and Dangori RFs (Fig 7.2). Main justifications are :

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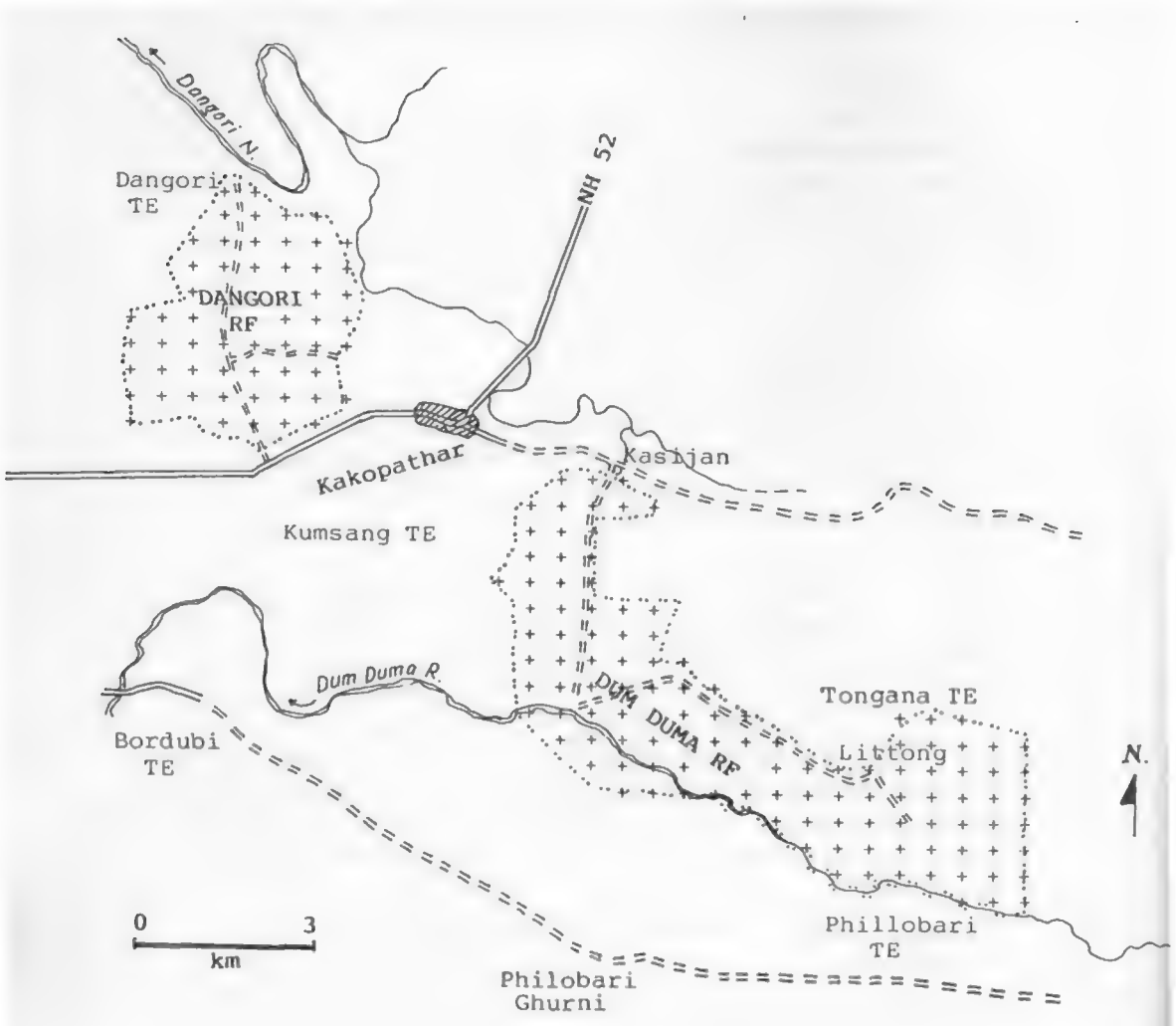

Fig 7.2 The proposed Dum Duma-Dangori Wildlife Sanctuary

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(i) Both are major haunts of the WWW duck. As many as 14 ducks, in loose association, were observed by me in a site of Dangori RF in November, 1995.

(ii) Both are remnants of a large tract of tropical rain-forest on flat plains.

(iii) Also rich in primates and birds.

(iv) Can be declared a single sanctuary with two disjunct parts as both are separated by a gap of only 3 km, which is insignificant for a bird like the WWW duck. The duck regularly moves between the reserves.

(v) Excellent infrastructure is already in Kakopathar, located at about mid-way between the two reserves.

The schedule of the proposed wildlife sanctuary is as follows:

(A) Location :

District (civil)	:—Tinsukia
Sub-Division (civil)	:—Tinsukia
Forest Division	:—Dum Duma.
Area	:—38.0sq km (Dum Duma RF —28.8 sq km; Dangori RF—9.2 sq km).

(B) *Boundary descriptions:*

Existing notified boundary of the Dum Duma and Dangori RFs.

7.1.3 **KUMSONG WILDLIFE SANCTUARY :** In Tinsukia district of Assam. To cover part of Kumsong RF (Fig 7.5). An excellent habitat with adundant jungle pools. However, because of encroachment, only 15.0sq. km out of 22.5 sq km of the Reserved Forest have been recommended for sanctuary.

7.1.4 **NAMPHAI WILDLIFE SANCTUARY :** In Tinsukia district of Assam. Habitat contiguous with Tinkopani RF and Namphuk RF (Arunachal Pradesh) (Fig 7.3). A good area for the WWW duck. Area, 21.0 sq km of flat terrain with many jungle pools and nullahs. Of these, 17.0 sq. km have been recommended for sanctuary with future extension towards Tinkopani RF.

7.1.5 **DIGBOI WILDLIFE SANCTUARY :** In Tinsukia district of Assam. To cover a small part of Upper Dihing (East block) RF near Digboi oil fields. However, Digboi RFs (East and West blocks) will not form part of this proposed sanctuary (Fig 7.5). A magnificent reservoir with marshes

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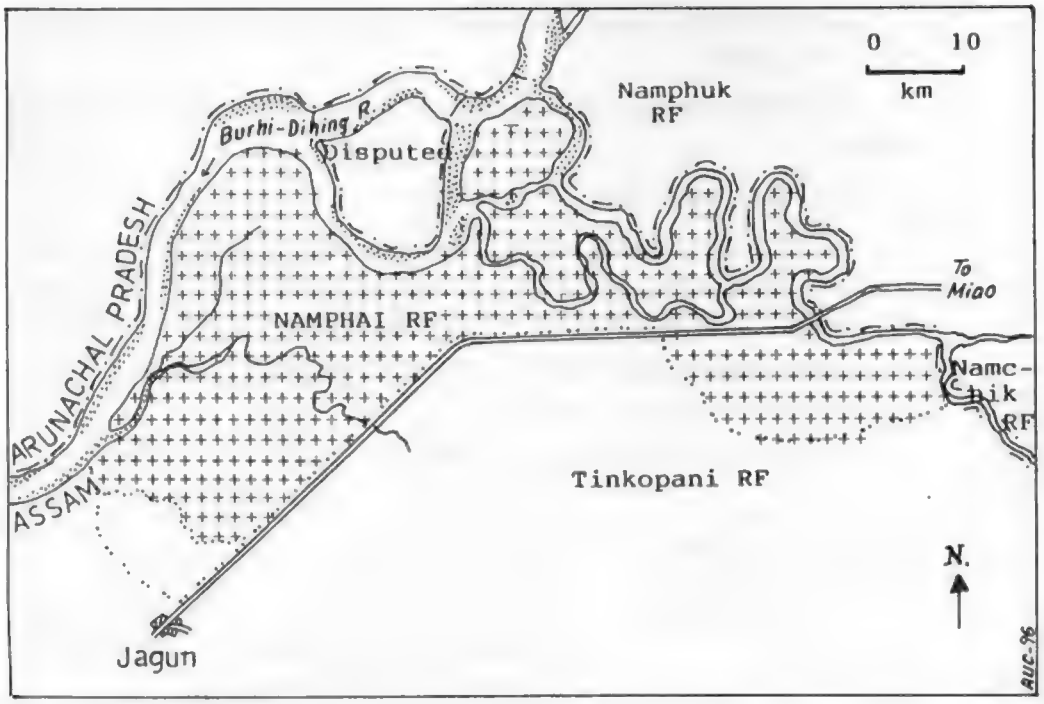
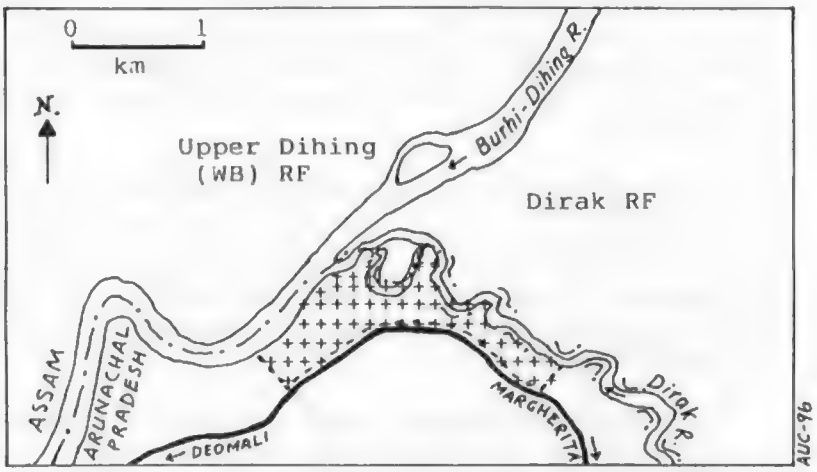


Fig 7.3 Proposed Namphai Wildlife Sanctuary,Assam (top) and Dirak Beel Sanctuary, Arunachal Pradesh(bottom)



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measuring about 15 hectares, have been formed due to construction of a small dam across a forest stream. The reservoir is surrounded by tropical rain forest almost on all sides. Towards north lies the Boiler No. 515 of Assam Oil Division. An area of about 35.0 sq km, south of the Digboi-Pengeri Gate road (known as "Oil Road"), has been recommended as a sanctuary.

An excellent WWW duck area. Lot of wintering waterfowls throng the reservoir. Elephant, gaur, sambar, dhole, tiger, hornbills, etc., are other noteworthy species.

7.1.6 **KOBO-POBA WILDLIFE SANCTUARY:** In Dhemaji district of Assam. To cover the entire Poba RF and Kobo Chapori proposed RF (Fig 7.5). Main justifications are:

(i) Kobo Chapori is an excellent grassland area and an important habitat of the Bengal florican.

(ii) Poba RF is a tree forest and is a potential WWW duck area.

(iii) Both are located in an ecologically fragile zone where the Siang and the Lohit rivers meet. The Siang river makes a bend and flows towards west as the Brahmaputra from this point.

(iv) These forests link Dibru-Saikhowa Sanctuary of Assam with that of D'Ering Sanctuary of Arunachal Pradesh. An important elephant movement route.

(v) Also rich in other wildlife, including wild buffalo, tiger, and waterfowls. For migratory waterfowls, it is among their last staging areas in India before they fly to their breeding grounds.

The schedule of the proposed wildlife sanctuary is as follows :

(A) *Location :*

District (civil)	: Dhemaji.
Sub - Division (civil)	: Jonai
Forest Division	: Lakhimpur
Area	: 195.8 sq km (Poba RF - 101.8 sq km; Kobo Chapori RF - 94.0 sq km).

(B) *Boundary description :*

Existing notified boundary of Poba RF and Kobo Chapori PRF.

7.1.7 **DIBANG RIVER NATIONAL PARK :** In Dibang Valley district of Arunachal Pradesh. To cover Dibang RF (part), Kerim RF (part), and

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Sirkee proposed RF (whole) (Fig 7.4). The main justifications for declaring the area as a National Park are :

(i) This area is a key site for the Bengal florican. The area has the WWW duck too.

(ii) Excellent grassland on the chapories of the Dibang river.

(iii) Rich in other wildlife; wild elephant, tiger, wild buffalo, gaur, dhole, sambar, hog deer, and many species of waterfowls, especially in winter. An important flyway of migratory waterfowls. A new migration route of the cranes have been discovered here (Choudhury,1994 b,c).

The schedule of the proposed National Park is as follows :

(A) *Location :*

District (civil)	:—	Dibang Valley
Sub-Division (civil)	:—	Roing and Dambuk.
Forest Division	:—	Dibang Valley
Area	:—	202.0 sq km (Dibang RF—125.0 sq km; kerim RF—23.0 sq km; Sirkee proposed RF—54.0 sq km).

(B) *Boundary description :*

North :—Northern boundary of the proposed Sirkee RF.

East :—Eastern boundary of the proposed Sirkee RF, then follows the existing eastern boundary of Dibang RF upto the point where it touches the boundary of Kerim RF, then follows the eastern boundary of Kerim RF upto Arunachal Pradesh-Assam interstate border.

South :—From the south-eastern tip of Kerim RF follows the Arunachal Pradesh-Assam interstate border towards west upto Bijari-Paglamghat road. The areas dereserved recently near the road will be outside the proposed National Park.

West :— From the point where Bijari-Paglamghat road touches the interstate border (Arunachal-Assam), excluding the recently dereserved areas, follows the road upto Bomjir, then follows the western boundary of the proposed Sirkee RF.

7.1.8. **NAMCHIK WILDLIFE SANCTUARY :** In Changlang district of Arunachal Pradesh. Habitat contiguous with Namphuk RF, Namphai

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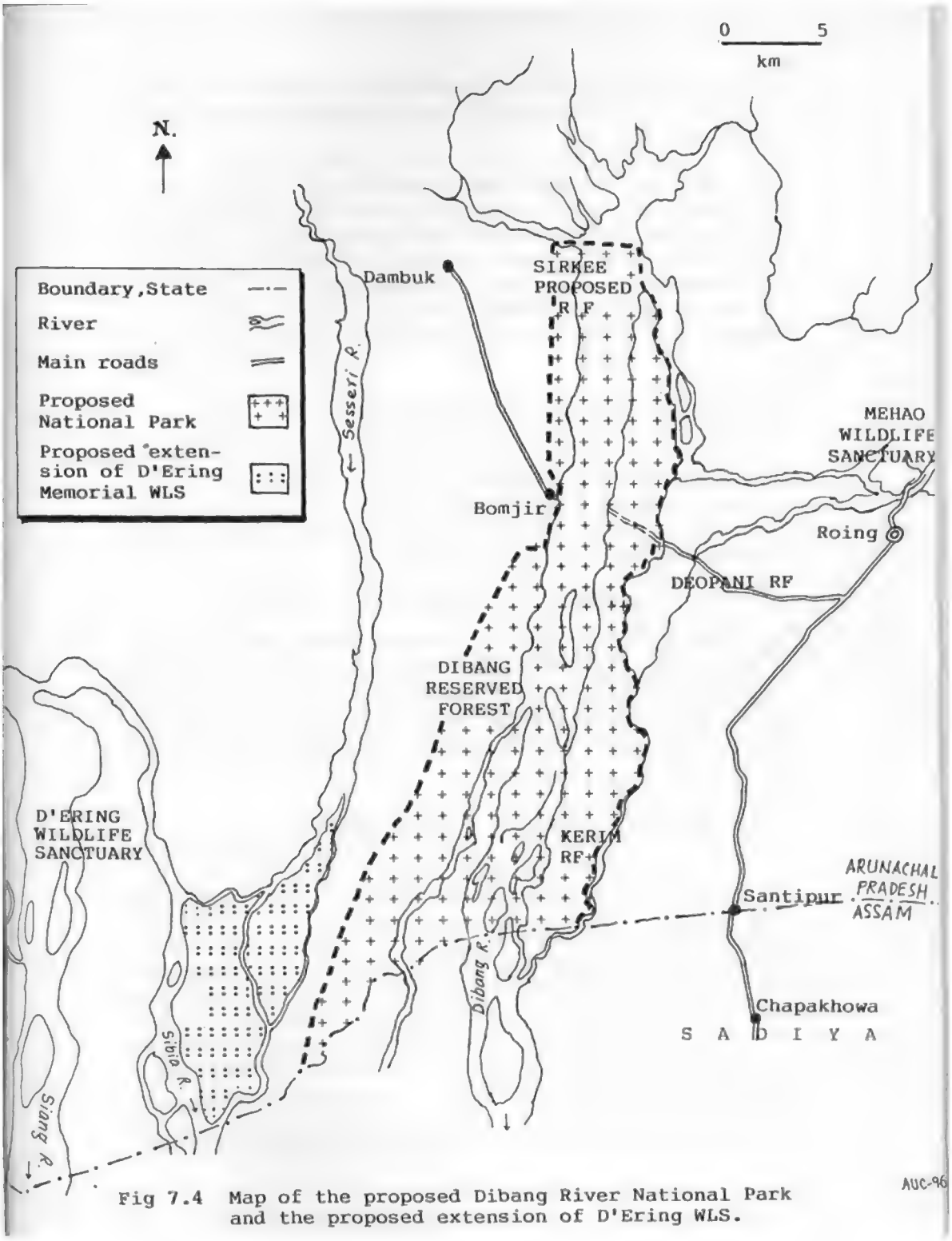

Fig 7.4 Map of the proposed Dibang River National Park and the proposed extension of D'Ering WLS.

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RF and Tinkopani RF (Fig 7.5). A good area for the WWW duck. About 45.0 sq km, out of total area of 49.8 sq km, has been recommended for wildlife sanctuary.

7.1.9 **NAMSANG or DIRAK BEEL SANCTUARY :** In Tirap district of Arunachal Pradesh. This small ox-bow lake near the confluence of the Dirak river with Burhi-Dihing river is an important haunt of the WWW duck. The lake or *beel* is actually on the inter-state boundary and the Assam-side (Dirak RF) has already been recommended as a National Park (Upper Dihing, see 7.1.1). A small sanctuary covering only 2.0 sq km of Namsangmukh VRF has been recommended for a sanctuary (Fig 7.3).

7.2 *Extension of existing Protected Areas :*

D'Ering Memorial WLS be extended to cover the grassland located between the Sibia and the Sesseri rivers (Fig 7.5). This area is a known habitat of the Bengal florican. The Garampani WLS (outside the study area) also needs to be expanded by adding the entire Nambor (North block)RF, excluding the old encroachments.

7.3 *Better Management of existing Protected Areas :*

The existing protected areas such as Dibru-Saikhowa WLS , D'Ering WLS, Mehao WLS, and Namdapha NP should be provided with better infrastructural facility and more resources. The communication system needs much improvement and wireless should be provided. These are also required in Nameri WLS, Garampani WLS and Pakhui WLS (outside the study area).

7.4 *Protection Measures in Reserved Forests :*

Since it is not possible to declare all the sites as national parks or sanctuaries, some protection measures need to be taken wherever the duck and the florican occurs. Some such areas are : Burhi - Dihing RFs, Duarmora RF, Phillobari RF, Kakojan RF, Tokowani RF, Torani RF, Tinkopani RF, Namsangmukh VRF, Namphuk RF, Tengapani RF, Manabum RF, Dibang RF (outside the areas proposed as National Park), Upper Dihing RFs (outside the areas proposed as National Park and WLS), Hahkhati RF, Mesaki RF and the smaller Reserved Forests in the chapories of the Lohit river located between Namsai and Wakro, and in the chapories between the Sibia and the Sesseri rivers.

7.5 Commerical felling of trees including removal of old and dead trees

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(used by WWW duck for nesting) in all the potential sites should not be allowed. Uncontrolled cutting of thatch, etc., grass should also be checked.

7.6 Steps should be taken to prevent further encroachment in the rain forests and the grasslands. Immediate steps should be taken to evict the fresh encroachers from the Reserved forests. The boundaries of the Forest villages such as Laika and Dadhia in Dibru-Saikhowa WLS, Lakhipathar, Choraipung, Borjan, Dimoruhola in Upper Dihing (WB) RF and Kherjan, Bhimporapathar and Dhekiajan in Upper Dihing (EB) RF should be re-demarcated as all these villages have since been expanded due to encroachment by the Forest villagers. As a policy, no new "Forest Villages" should be set up anywhere.

7.7 The locals, especially the Forest villagers, encroachers, tea-garden labourers, graziers, and those who live near the forests should be apprised of the legal status as well as the critically endangered position of the surviving wild population of the WWW duck and the Bengal florican. They should be specifically motivated not to collect any egg or duckling or chick. Posters and brochures be widely distributed among local villagers besides holding informal meetings at village-level. In this regard, the NGOs should come forward with their expertise and resources.

7.8 Since it is difficult to put a complete halt to hunting, trapping and collection of eggs and youngs of thinly distributed birds like the WWW duck and the Bengal florican, the offenders, once detected, should be brought to the book as per the provisions of the Indian Wild Life (Protection) Act, 1972, which prohibits killing and capture, dead or alive, of any Schedule I species.

7.9 All the potential areas mentioned is the text should be thoroughly surveyed and then monitored regularly.

7.10 *Captive Breeding to be discouraged :*

The captive breeding of the WWW duck should not be taken up again in view of the past experience. Since the present survey have found a viable population in the study area, the urgent need of the moment is to protect the surviving wild populations.

7.11 *Role of Tea Gardens :*

Many of the tea gardens in the study area are at the fringe of Reserved forests where the WWW duck occurs. The ducks often haunt the nullahs,

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Fig 7.5 Proposed protected areas and sites of recommended 'safe havens' for WWW ducks (●), and fenced grassland plots for Bengal florican (#).

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drains and ponds inside the tea plantations. In winter, when many jungle pools dry up, the ducks are disturbed in the remaining areas by fishermen and woodcutters. In some bigger tea gardens which are contiguous with known WWW duck areas, small areas measuring 2 or 3 hectares may be set aside as 'safe havens' for the ducks.In those havens, small reservoirs may be constructed (by putting an earthen or stone bundh across a drain or nullah with sufficient trees (some may be planted) along the banks. The areas may be fenced off (low fencing with open sky) for safety to prevent cattle and unauthorised entry of human beings.

To start with, the 'safe havens' may be created in Bogapani TE (near Upper Dihing East block RF), Phillobari TE (near Dum Duma RF), Powai TE (near Upper Dihing West block RF), Dangori TE (near Dangori RF) and Namdang or Dirak TEs (near Dirak RF) . No ducks are to be caught. This will go a long way is the preservation of the WWW duck as this will supplement its habitat and food besides providing safe refuge to a part of the wild population (Fig 7.5).

7.12 *Fencing of grassland patches :*

In Amarpur sector of Dibru-Saikhowa Sanctuary, it has been observed that the floricans are confined mostly to the fenced plots of the Soil Conservation Department. These plots were relatively less disturbed than other grassland areas. Hence, in disturbed grasslands like Sibia chapori, Miri Chapori and Bhim Chapori (all in Sadiya, and outside protected areas), some grassy plots measuring 100 to 200 hectares may be fenced off as 'Florican havens' for safe breeding of the floricans (Fig 7.5).

7.13 *Pollution Control :*

No fresh drilling for oil should be allowed inside the Upper Dihing RFs. Proposed drilling inside Joypur RF should be shelved. No refuse should be allowed to be dumped inside the forests.

Use of dangerous non-biodegradable pesticides like Thiodan, etc., in the tea plantations should be stopped.

Both the Oil India (including Assam Oil Division) and the tea plantations should take immediate steps to check further pollution of water bodies and also take steps to treat the already polluted waterbodies (especially the ponds usually dug near the rigs).

The treatment plant of Digboi Refinery should be expanded as it has been observed to be inadequate in the present situation (eg., severe pollution of Tel Nala).

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7.14 In the proposed protected areas for the WWW duck, natural regeneration be preferred. However, since regeneration may take time, plantations of local species, especially those which once existed in the area and are useful to the duck, may be taken up.

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Appendix Ia. RECORDS OF WWW DUCK IN DUM DUMA AND DANGORI RFs, TINSUKIA DISTRICT

Location	Coordinates	Date	No. of Ducks	Remarks
SE boundary of Dum Duma RF, near Phillobari TE.	27°35 ´N, 95°43 ´E	Mid-70s	4 ducklings	A labourer collected them from a nest in a *Bischofia javanica* tree. (A.A.Khan, a garden staff)
Nam-Hulung, RF Dum Duma RF	27°36´ N,95°43´E	Summer, 1988	1 adult 8 ducklings	Seen in a small nullah (S, Kalita, Forest Staff).
Dangori RF, *c.* 2 km from Tejigaon	27°38 ´ N,95°38´E	1989	1 duckling	Seen by a local resident.
Ghulajan, Dum Duma RF	27°36 ´ N,95°41´E	Summer, 1991	6 ducklings	Seen in a small sluggish nullah. (J. Buragohain, Forest staff).
Sookerating Nullah, Dum Duma RF	27°35´ N,95°42´E	February, 1992	3	Seen in the nullah, (Robin Phukan , Forest staff).
Hanhchara, Dangori RF	27°38´ N,95°38´E	*c.* July, 1992	2	Foraging in shallow water amidst tall grass and trees (*c.* 11.00am) (Bhogeswar Baruah, Forest staff)
Dubajan, Dangori RF	27°38´ N,95°38´E	*c.*July-August 1992	1 duckling	Duckling (possibly 2) seen in the water whilst its mother gave alarm call from a tree - top. (Bhogeswar Baruah and Mothen Gohain, Forest staff).
Dubajan, Dangori RF	27°38´ N,95°38´E	November, 1992	1	Flew away after being flushed from marsh (Bhogeswar Baruah and Mothen Gohain, Forest staff)
Sessajan, Dangori RF	27°38´ N, 95°38´E	November, 1992	2	Foraging in shallow water in this marshy channel (Bhogeswari Baruah, Forest staff).

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Appendix Ia (cont'd)

Northern boundary of the RF in Dangori TE	27°38′ N,95°38′ E	November, 1992	2	In flight from west to east (Sadhu Munda).
Lohali, Dangori RF	27°38′ N, 95°38′ E	Nov-Dec, 1992	3	Perched in a tree and flew around before flying away (*c.*5.00 am).
Western part of Dangori RF (possibly near Lohali)	27°38′ N,95°38′ E	December, 1992	1	On water then flew away (Mileswar Moran)
SE part of Dum Duma RF, Near Phillobari TE.	27°35′ N, 95°43′ E	December, 1992	2 pairs	Resident in the area. Frequently seen. (A.A. Khan, a garden staff).
Sotingjan, near Kolakhowa Dum Duma RF	27°36′ N,95°42′ E	Summer, 1992	6 ducklings	Caught by a local. Forest department staff rescued and released 3, rest died. (Chandra Moran, Forest staff).
Ghulajan, Dum Duma RF	27°36′ N,95°41′ E	28 March, 1993	12	Roosting in a *Ficus* tree, at *c.* 3.00 pm (Keshab Baruah and Chandra Moran, Forest staff).
Sookcrating Nullah, Dum Duma RF	27°35′ N,95°42′ E	Summer, 1993	6 ducklings	Caught by a local from a nest, which was placed in thecavity of a broken *Albizzia* sp. (Moz) tree. 2 rescued by Forest staff and released in Ghulajan.
W. of Kakopathar Dev. Block Office, Dangori RF	27°38′ N,95°38′ E	Summer, 1993	ducklings	Some ducklings seen inside forest (Robin Phukan, Forest staff).
W. of Kakopathar Range Office, Dangori RF	27°38′ N,95°38′ E	16 November, 1995	2	Flew down from a tree to a nullah near the main Forest road (A. Hakim Choudhury).

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Appendix Ib. RECORDS OF WWW DUCK IN DIBRU-SAIKHOWA SANCTUARY, TINSUKIA AND DIBRUGARH DISTRICTS

Location	Coordinates	Date	No. of Ducks	Remarks
Burhi *beel*	27°40′ N,95°25′ E	1981-82	3	On water, at around midday (Ratna, a local labourer).
Kaitia	27°40′ N,95°27′ E	1991	5	Seen by Forest staff in a *beel*.
Near Dighaltarang	27°37′ N,95°25′ E	1991	2	On water , in the evening (Thoyo-kisan, a labourer).
Mora Dolki	27°36′ N,95°18′ E	1991	2	Flew away from a nest in a Hatipolia tree. One egg collected by an ex-tea garden labourer from the nest.
Panki-Kauri Pathar	27°38′ N, 95°17′ E	1991	2 adults 2 ducklings	Ducklings shot with slingshot by local Misings (a tribe) of Laika while the adults flew away.
Houlmari Hula	27°37′ N,95°25′ E	Jan- Feb,1992	6	Seen early in the morning (Hari, a local labourer).
Kochuoni Pathar	27°35′ N, 95°23′ E	April, 1992	Eggs	Collected by a villager of Baghjan from a nest in a *Salix tetrasperma* tree, located just outside the boundary of the sanctuary.
Hatighuli	27°46′ N, 95°31′ E	April, 1992	2	Seen in a tree by Forest staff.
Kolomi Tiniali	27°38′ N,95°19′ E	Summer, 1992	2	Seen in a ditch by the locals.
Dighaltarang	27°37′ N,95°25′ E	26 July, 1992	2	In flight (Beat Officer i/c).
Houlmari Hula	27°37′ N,95°25′ E	October, 1992	2	Seen on water at *c.* 3pm (Hari, a local labourer).
Kolomy	27°38′ N,95°20′ E	1 Nov, 1992	5	Seen in flight by Forest staff.
Borbhanga *beel*	27°35′ N,95°20′ E	Jan-March, 1993	1 pair	Seen in a small pool. Also seen previously in the same area.
Baghjan	27°35′ N,95°23′ E	Feb, 1993	1	Accidentally caught in a fishing trap.

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Appendix Ib (cont'd)

Schoolgora	27°38′N,95°24′E	10 March, 1993	2	In flight early in the morning(Forest staff).
Hatighuli	27°46′N, 95°31′ E	May-June,1993	2	*c.* 1.5 km W. of Hatighuli, at *c.* 2pm. (Dipen Sonowal, Forest staff).
Near Kolomy Camp	27°37′N, 95°21′E	Mid-1993	Ducklings	Unknown number caught in a fishing trap and collected by a villager of Garamjan.
Salbeel	27°37′N, 95°22′E	15 Oct, 1993	3	Seen on water (Forest staff).
Salbeel	27°37′N, 95°22′E	1993	3	In flight while 'honking' like flute at *c.* 4:30 pm. (Ganesh and Suku, Boatmen).
Amguri, Upper Salbeel	27°38′N, 95°22′E	9 December, 1993	3	In flight at 4.25 pm (Bishnu Gogoi, Nabin Gogoi and Sankar Upadhyay, all Forest staff).
Near Kolomy Camp	27°37′N,95°21′E	1992-94	2	Frequently seen in a lagoon of the Kolomy Nadi, *c.* 1.5 km NE of Kolomy Camp (Forest staff).
Bhokboki	27°36′N, 95°21′E	1992 -94	+	A small *beel* near Mora-Salbeel. The ducks haunt the site, especially in winter.
Mukchung Bam, Opposite Rangagora TE Factory	27°34′N, 95°17′E	10 Jan, 1994	2	In water, forenoon (Khelon Saikia,N. Gogoi, Bishnu Gogoi, Bolin Gogoi, all Forest staff).
Raidang *beel*	27°35′N,95°21′E	Feb-March 1994	2	In flight, in the morning hours (N. Sharma, Range Officer and staff).
Upper Salbeel	27°38′N,95°22′E	May, 1994	2	In flight, in the morning hours (N. Sharma, Range Officer and staff).
Western Torali	27°36′N,95°18′E	7 May, 1994	2 .	On water, in the morning (patrolling party of eight Forest staff).
Lower Salbeel	27°36′N,95°22′E	16 May, 1994	4	On water, in the morning (N. Sharma, Range Officer and staff).
Pani-Kauri Pathar	27°38′N,95°17′E	August, 1994	2	On water, at *c.*1.30 pm (N. Sharma, Range Officer and staff).
Garo Nala, NW of Hatighuli	27°46′N,95°30′E	December,1994	11	Two groups of 9 and 2 on water at *c.*7.30 am. (Asif Hazarika).

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Appendix Ic. RECORDS OF WWW DUCK IN UPPER DIHING RF (WEST BLOCK), TINSUKIA DISTRICT

Location	Coordinates	Date	No. of Ducks	Remarks
Choraipung	27°18′ N,95°28′ E	Late 1970s	1 adult 10-15 ducklings	Seen near Forest Range Office in July-August (Gaon Burha of Choraipung FV).
Pawoi Nadi, *c.* 1km downstream of Pawoi bridge on the forest road from Agbondha.	27°19′ N,95°36′ E	Late 1970s	1 adult 6 ducklings	Seen in a pool of the Pawoi Nadi, 1 duckling was caught which survived for about a month only. The adult was in 'moult' (Gabrel, Agbondha).
Near Borjan FV	27°22′ N,95°22′ E	21 January 1987	1	Seen in a forest pool at 10:30 am. (P. Kataki, Saha and Gayon, Forest officials).
Near Borjan FV.	27°22′ N,95°22′ E	21 January, 1887	2 pairs	Seen in two different forest pools within 0.5 km of each other. The ducks were perched on tree-branches/logs. 4:20-25pm. P.Kataki, Saha and Gayon, Forest officials).
Digboi Nadi, near Nagajan	27°22′ N,95°29′ E	Mid-1980s (1985-87)	2 adults 6-7 immatures	Seen in Digboi N. All flew away, (Robin Moran, Dimoruhola FV).
Pawoi Nadi	27°20′ N,95°36E	Mid-1980s (1986-87)	4 pairs	Two pairs each seen in N. and S. of the forest road, perhaps more were there (Gabrel).
Janglu Nadi, near Forest road.	27°18′ N,95°33′ E	Mid-1980s (1986-88)	3 pairs	Seen in the pools of the nadi in three separate sites. More were probably there. More ducks are found in Janglu than Pawoi (Gabrel, Agbondha).
Jorajan, near Choraipung	27°20′ N,95°30′ E	Late 1980s (1987-88)	3 ducklings	Caught near Jorajan and kept by an uncle of the informer. All survived well and were eaten up on reaching adulthoo (Nim Deka, Nagajan).

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Appendix Ic. (cont'd...)

Nagajan	27°22′ N,95°29′ E	1991	2 ducklings	Caught from a pool. 1 died while the other survived (Nim Deka, Nagajan).
Near Nagajan	27°22′ N, 95°29′ E	Early 1990s	1 duckling	Caught in the jungle and kept as pet. Flew off to the wild on reaching maturity.
Near Nagajan	27°24′ N, 95°29′ E	Early 1990s	7-8 adults	Maximum seen at a time by the local villagers of Dimoruhola, near Nagajan.
NW of Choraipung	27° 20′ N, 95° 28′ E	1991	6-7 fledged ducklings	Caught with the help of domestic dog and consumed, in one or twos (Janak an ex-tea garden labourer, Sopatoli).
NW of Choraipung	27°20′ N, 95°28′ E	1992	2 fledged ducklings	Caught with the help of domestic dog and consumed (Janak, an ex- tea garden labourer, Sopatoli).
Digboi Nadi, E. of Nagajan	27° 22′ N, 95°29′ E	1992	2 ducklings	Caught from forest pool, 1 died, other survived. The adult duck was then sold off at Duliajan market by the owner.
Near Nagajan	27°22′ N, 95°29′ E	1992	1	Killed with a stick in a secluded forest pool (a local villager of Dimoruhola FV).
Kheto Nadi, E. of Dimoruhola FV	27°26′ N, 95°29′ E	1992 (August-October)	3-4	Seen in the sluggish channel called Kheto (Biren Moran, Dimruhola FV).
Janglu Nadi, near Kurka	27°18′ N, 95°33′ E	Nov-Dec. 1992	10-12 pairs	A party of 'turtle-hunters' saw 10-12 pairs in a stretch of *c.* 1 km of this sluggish channel inside dense rain forest (Janak, who led the 'hunters').
c. 2 km W of Borjan FV	27°21′ N, 95°32′ E	July-Aug, 1992	1 adult 15 ducklings	Caught while trying to cross the Digboi-Duliajan road from north to south. All the ducklings died within $1^1/_2$ month, mostly due to injuries caused by domestic ducks (Pulak Saikia, Borjan FV).

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Jorajan, near Rig No. 25	27°20′ N, 95°30′ E	July-August 1992	2 adults 4-5 ducklings	Seen in a pool near the Oil Rig.They were foraging (Gaon Burha of Choraipung).
Eralihola, near Choraipung	27°19′ N, 95°28′ E	1992	+	Ducks with ducklings seen but not counted in this marshy pool (Forest staff).
Kopohuagaon, Lakhipathar FV	27°25′ N, 95°32′ E	1993	+	Frequently haunts tanks and ponds at dusk, night or dawn (Mondip Gogoi, Kopohuagaon).
Tel Nala near Lakhipathar FV	27°23′ N, 95°33′ E	1993	+	Regularly seen in this sluggish channel Till confiscation of the arms in due to insurgency, the villagers often used to shoot the ducks. (Mondip Gogoi, Kopohuagaon).
c. 1 km E. of Nagajan	27°22′ N, 95°30′ E	June, 1993	1 adult 3 ducklings	Seen in a nullah. Ducklings were caught,2 died subsequently (RobinMoran, Dimoru-hola). One survived and was observed by me in August and October, 1993. It often used to fly off to the forest only to come back again. It died of unknown disease.
Choraipung	27°19′ N, 95°29′ E	June, 1993	2	In flight over Choraipung-pathar, at c. 4 pm (Bhuram Gogoi).
Choraipung	27°19′ N, 95°29′ E	April, 1993	5	Seen feeding in the watered field of Choraipung pathar.They were in pairs/ loose group (Bhuram Gogoi).
Mothla Nogabari, c.0.5. km W of Nagajan	27°22′ N, 95°28′ E	August, 1993	2	Flushed from a small marsh,outside reserved forest (Nim Deka, Nagajan).
Near OIL Magazine, Choraipung	27°21′ N, 95°30′ E	June-July, 1993	2 adults 8-10 ducklings	Seen in a pool (Salkhen Majhi, Choraipung).

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Appendix Ic. (cont'd...)

NW of Choraipung, W. of Digboi Nadi	27°20′ N, 95°28′ E	July, 1993	2	In a small *beel* inside forest (Saikhen Majhi).
E/SE of Nagajan	27°22′ N, 95°32′ E	October 1993	2	In a pool inside forest, *c.* 5-6 km from Nagajan, at *c.* 7.30-8.00 am. (local villagers).
Tipling Nadi, near Dimoruhola	27°23′ N, 95°28′ E	October, 1993	+	Regularly seen in the pools of the nullah (local villagers).
Bandormora Ghuli	27° 22′ N, 95°28′ E	October, 1993	+	Regularly seen in the pools of the nullah (local villagers).
Nagajan	27°22′ N, 95°28′ E	Oct.1993	+	Frequently seen in flight (local villagers).
Mothla Nagabari	27°22′ N, 95°28′ E	Oct.1993	+	Frequently seen in flight (local villagers).
Near OIL Magazine, Choraipung	27°21′ N, 95°30′ E	June-July 1993	4 adults Many ducklings	3 adults caught by dog while the remaining were by labourers. None could fly suggesting that they were on moult. The ducklings could not be caught, all hid among vegetation.
Choraipung	27°19′ N, 95°29′ E	April-May 1993	1 duck	Caught with the help of a lasso by an ex-tea garden labourer when the duck came to the watered fields after a shower.
NW of Choraipung	27°20′ N, 95°28′ E	Sept., 1993	1 fledged duckling	Caught with the help of domestic dog from a forest pool (Janak, Sopatoli).
NW of Choraipung	27°20′ N, 95°28′ E	Oct-Nov, 1993	2	Seen in the same (as above) forest pool (Janak, Sopatoli)
NW of Choraipung	27°20′ N, 95°28′ E	Last week of Nov, 1993	2	Seen in the same (as above) forest pool (Janak, Sopatoli).

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Appendix Ic. (cont'd...)

NW of Choraipung	27°20′ N, 95°28′ E	Sept, 1993	+	Ducklings reported from a pool. South of the above site. (Janak, Sopatoli, who also tried to catch the ducklings but could not).
W of Borjan FV	27°22′ N, 95°22′ E	1993	+	A *beel* inside forest is a regular haunt of the duck (Janak, Bhuram Gogoi).
Near Digboi-Duliajan road, between Choraipung & Nagajan	27°21′ N, 95°29′ E	1993	+	A ditch, often haunted by the duck (BhuramGogoi).
W. of Borjan FV	27°22′ N, 95°22′ E	Aug-Sept, 1993	3	Seen in a pool/nullah, *c.* 1km W of Borjan FV and 1.5 km N. of the Digboi-Duliajan road (Pulak Saikia).
W. of Borjan FV	27°22′ N,95°22′ E	1992-93	4-5	Seen in a *beel, c.*1km. W.of Borjan FV & 1 km.N.of Digboi-Duliajan road, at *c.* 9.00-9.30 am.(Bipul Saikia, Borjan FV).
Pawoi Nadi	27°21′ N, 95°36′ E	April-May, 1993	2	In a river pool, N.of the forest road (Moina Rai, Agbondha).
Burhi-Dihing River,near Kurka	27°22′ N, 95°33′ E	1993	+	Seen on many occasions (Moina Rai, near Agbondha).
Kaladubi	27°20′ N, 95°37′ E	1993	2	Regularly seen in this forest pool, 2 km NW of Agbondha (Gabrel).
Pawoimukh, outside the in reserved forest	27°17′ N, 95°36′ E	1993	+	Frequently seen at dawn, dusk or at night, Burhi-Dihing River (Garbrel).
Dhobi Nala, Agbondha, outside reserved forest	27°19′ N, 95°38′ E	Oct-Nov, 1993	+	'Honk' heard at night (Garbrel).
Erali Hola	27°19′ N, 95°28′ E	1993	+	Frequently seen in this marshy pool (Bhuram Gogoi).

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Appendix Ic. (cont'd...)

Dighal Chot	27°19′ N, 95°28′ E	1993	+	Frequently seen in this marshy pool (Bhuram Gogoi).
Pool near Jorajan	27°20′ N, 95°30′ E	1993	+	Frequently seen in this marshy pool (Bhuram Gogoi).
Near Choraipung proper	27°19′ N, 95°29′ E	Mid-June 1994	2	Seen preening while perched on a fallen log, at *c.* 2-2:30 pm (Bhuram Gogoi).
Choraipung	27°19′ N, 95°29′ E	May, 1994	1 adult 2 adults 2 adults	Seen on three different days in the watered (after heavy down-pour) Choraipung pathar at *c.* 4:00 pm (Bhuram Gogoi).
Choraipung	27°19′ N, 95°29′ E	April or May 1994	2 adults 2 adults	Seen on two different days, in a small pool located between Jorajan-Nagajan Tinali (right bank of the Digboi N) at 11:00 am and 9 am. (Bhuram Gogoi).
Balijan	27°22′ N, 95°34′ E	June, 1994	2 adults Many ducklings	Four ducklings caught from a small marsh at *c.* 12 noon. The marsh contained lot of arums (Meghand Tudu, Balijan). I observed the ducklings on 11 and 15 July, 1995.
Balijan	27°22′ N,95°34′ E	10 July, 1994	2	Seen at a pool at *c.* 12 noon near Balijan.
Choraipung	27°20′ N, 95°29′ E	25 May, 1994	2	In a roadside pond near JJ 25 at 8:30 am (Forest staff).

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Appendix Id. RECORDS OF WWW DUCK IN UPPER DIHING (EAST BLOCK) AND KAKOJAN RFs

Location	Coordinates	Date	No. of Ducks	Remarks
Near Enthem, UD RF (EB)	27°23′N,95° 46′ E	1971	2	In water, then flew away.
Dibru river, near Nazirating, boundary of Kakojan RF and UD RF (EB)	27°28′N,95°38′E	1986-87	2	In the river around evening (Paneswar Porja, labourer).
Dibru river, SE boundary of Kakojan RF	27°28′ N, 95°38′E	1990-91	2	Seen near the river (a tea garden-labourer).
UD RF (EB)	27°25′ N, 95°42′ E	1989-93	10-12	Snared by crude method (with lasso, etc.), all singly, by a person called Anand Masi-Hasa (Theebu of Dhekiajan FV).
Between Pengeri Gate and Khatangpani, UD RF (EB)	27°26′ N,95°44′ E	April, 1991	1 adult 8 eggs	Collected from a nest on the ground, amidst dense *Arunda donax* reeds on an island in a pool. An adult bird flew away from the nest (Anand Masi -Hasa/Theebu). I visited the site subsequently.
Dibru river, E of Nazirating border of Kakojan and UD(EB) RFs.	27°28′N,95o38′E	Oct, 1992	2-4 adults	In flight a dusk.(T.Moran)
Near Pengeri Gate, UD RF(EB)	27°26′N,95°43′E	Nov-Dec 1992	2,2,2,	In a pool. Seen in the morning hours on three different days (Theebu).
'Dilpi', UD RF(EB)	27°24′N,95°4′E	Nov-Dec 1992	8,2	In the reservoir. Seen in the morning hours on two different days (Theebu).
Near Rig No.650, UD RF(EB)	27°26′N,95°44′E	Nov-Dec, 1992	3,2	Seen in a pool in the morning hours on two different days (Theebu).
East of Rig No.650, UD RF(EB)	27°26′N,95°44′E	Nov-Dec. 1992	2,2	In a pool near the main road. Seen in morn ing hours on two different days (Theebu).

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Near Pengeri Gate, UD RF(EB)	27°26′ N,95°43′ E	Nov-Dec. 1992	4,1	In a pool. Seen in the morning hours on two different days (Theebu).
Near Pengeri Gate, UD RF(EB)	27°26′ N,95°43′ E	Nov-Dec. 1992	2,3,4	In a pool. Seen in morning hours on three different days (Theebu).
Near Pengeri Gate, UD RF(EB)	27°26′ N,95°43′ E	Nov-Dec. 1992	2,2	In a nullah. Seen in morning hrs on two different days (Theebu).
Near 'Dilpi',UD RF(EB)	27°24′ N,95°42′ E	1992	1 adult 8 ducklings	Seen crossing the main road. All the ducklings were caught by the staff of Oil India Ltd.(Assam Oil divn.) (Theebu).
Between Pengeri Gate and Khatangpani,UD RF(EB)	27°26′ N,95°44′ E	1992	5	Seen in reedy pool.
Between Pengeri Gate and Khatangpani, UD RF(EB).	27°26′ N,95°44′ E	June.1993	2	Seen in a reedy pool.
Dhekiajan FV,UD RF(EB)	27°27′ N,95°42′ E	Aug,1993	+	Frequently seen in the watered fields and tanks at night (Robin Sonowal,Theebu).
Khatangpani nullah, UD RF(EB)	27°26′ N,95°45′ E	Sept,1993	2	In the nullah (Ranjit Gogoi, Forest staff).
Near Pengeri Gate,UD RF(EB)	27°26′ N,95°43′ E	Oct,1993	2	Perched on a oil pipe overhanging a pool, at 9.00 am (Theebu).
Near Nazirating, UD RF(EB)	27°28′ N,95°37′ E	1 June, 1994	3	In flight from the forest towards Sri Krishna TE at dusk. During the last one month seen on at least four occasions,all in the flight (Bimal Borah, mahout).
Near Pengeri Gate,UD RF(EB)	27°26′ N,95°43′ E	Oct-Nov. 1995	1	Snared by a Nepali villager of Dhekiajan FV. Subsequently released in the wild due to pressure from villagers (who were motivated during this study).

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Appendix Ie. RECORDS OF WWW DUCK IN OTHER AREAS OF TINSUKIA DISTRICT.

Location	Coordinates	Date	No. of Ducks	Remarks
Duarmora RF	27°31′ N,95°51′ E	1968-71	7-8 ducklings	Fledged ducklings seen in August,in the W side of the forest (Gogoi,Beat officer).
Duarmora RF	27°31′ N,95°51′ E	1968-71	*c.* 6 ducklings	Collected by a villager of Kothalguri, (Gogoi, Beat Officer).
Mesaki RF	27°42′ N,9540′ E	1980-81	4--5	In flight,in the evening hours(Forest staff).
Dirak RF	27°16′ N,95°37′ E	1984	1 adult 5 eggs.	Seen in a nest on the ground, on the banks of Lekhajan. The adult could not fly (on moult !) (Gabrel).
Naloni RF	27°29′ N,95°42′ E	1985-88	+	Regularly heard call of the ducks in flight (Purneswar Moran,logging contractor)
Hahkhati RF	27°44′ N,95°40′ E	1989	+	Frequently seen in flight and also in forest pools (Forest staff).
Namphai RF	27°25′ N,95°55′ E	*c.*1990	2	In flight near the main salt-lick at *c.*11.00 am. Also seen on many other occasions,usually in twos(Purneswar Moran).
Tinkopani RF	27°30′ N,95°35′ E	1990-91	2	Seen in flight on many occasions in the afternoon hours,usually from W to E across the Jagun-Jairampur road (Purneswar Moran).
Kotha RF	27°23′ N,95°52′ E	1990-91	2	Seen in flight on a few occasions (P.Moran)

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Appendix Ie. (cont'd...)

Kumsong RF	27°44′ N,95°44′ E	1991	4 eggs	Collected by a villager and were hatched. Grown-up ducklings were collected by the Forest Deptt.staff.
Tokowani RF	27°30′ N,95°35′ E	1992	2	Regularly seen in flight at dusk in the SE areas of the forest (Mongal Karmakar).
Namchik river, Tinkopani RF	27°23′ N,96°0′ E	1992	+	Occasionally reported from river-pools.(S.Phukan,Beat Officer).
Lohit river, near Sadiya	27°48′ N,95°43′ E	Feb,1992	2	Seen in a lagoon of the river(G.Das, Range Officer,Sadiya).
Bajaloni village	27°22′ N,95°28′ E	1992-93	2	Frequently came to a village pond, measuring *c*.10 X 6m, near a dwelling house,at night during the winter season.
Digboi town	27°23′ N,95°37′ E	1992-93	12 ducklings	Found inside the campus of Oil refinery; 4 reared but did not survive (Nanda Saikia, Borjan FV).
Tokowani RF	27°30′ N,95°35′ E	1993	2	Seen near the western boundary of the forest (Pardip Naek, a tea garden labourer).
Tokowani RF	27°30′ N,95°35′ E	June,1993	2 adults 4-5 ducklings	Seen in a small pool at *c*.2:30pm. The adults flew away while the ducklings hid behind vegetation (Purneswar Moran).
Tokowani RF	27°30′ N,95°35′ E	Aug-Sept, 1993	2	In flight near the southern boundary at around midday (Moneswar Moran, Forest staff).
Simoluguri Chuk village	27°25′ N,95°27′ E	24 Oct. 1993	+	Flew overhead at night, call heard (Siben Chetia, President of Gaon Panchayat).

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Appendix Ie. (cont'd...)

Digboi town	27°23′N,95°37′E	5 Dec. 1993	2	In a reservoir by the side of NH 38 (oppo site the one where I observed a duck on 3 March, 1993)(President of Golai GP).
Digboi town	27°23′N,95°37′E	2 February, 1994	2	In another reservoir near the above, at 6:00am. (President, Borbil GP).
Tokowani RF	27°30′N,95°35′E	Last week of May,1994	2	In flight near the southern boundary, at *c.* 8am.(Moneswar Moran,Forest staff).
Tokowani RF	27°30′N,95°35′E	3 June,1994	2	Perched in a Hollong(*Dipterocarpus macrocarpus*) tree at *c.*5 am. Then they took off, circled overhead and vanished (Pardip Nack).

Appendix If. RECORDS OF WWW DUCK IN DIBRUGARH DISTRICT.

Location	Coordinates	Date	No. of Ducks	Remarks
Tipam river, N.of the main bridge, Joypur RF	27°13′N,95°26′E	1967-68	2	Seen in flight(P.Moran).
Tipam river, Joypur RF	27°13′N,95°26′E	1982-84	2-3	Seen at least twice, in the river (R.Sonowal,DFO).
Near Tipam bridge,Joypur RF	27°13′N,95°26′E	1985	2	Perched in a tree during daytime (F.Rahman,Range Officer).
Namdang RF	27°20′N,94°55′E	1991	2	Seen foraging in Hakoi *beel* at around midday (Rajen Borah).
SW of Choraipung, not far from inter-district border (Tinsukia-Dibrugarh).	27°18′N,95°28′E	June,1993	2	Seen at *c.* 2 pm (Bhuram Gogoi).

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Appendix Ig. RECORDS OF WWW DUCK IN ARUNACHAL PRADESH

Location	Coordinates	Date	No. of Ducks	Remarks
Kharsang,Changlang district	27°23′ N,96°05′ E	Early 1980s	1	Brought to the Mini Zoo at Miao.
Near Bijari, Dibang RF, Dibang Valley dist.	28°0′ N,95°35′ E	1989	1	In a pool amidst tall elephant grass. (Chakravarty,ACF,Roing.)
Kharsang, Changlang dist.	27°23′ N,96°05′ E	Early 1990s	1	Brought to the Mini Zoo at Miao.
Khelbari, near Bijari, Dibang RF, Dibang Valley dist.	28°0′ N,95°35′ E	1990	2	Seen among the reeds. One ran over by a 4 wheel drive jeep while the other was shot (Baram Mena).
Near Anpun,SW of Bijari Dibang RF, Dibang Valley dist.	27°55′ N,95°32′ E	1991	2	Seen amidst reeds, one shot(Leto Mili).
Dirak or Namsang *beel*, Namsangmukh RF,Tirap District.	27°16′ N,95°32′ E	1991	2	Seen in the *beel* (a Khamti tribe).
Between Anpun and Paglam, Tinali,Dibang RF,Dibang Valley dist.	27°54′ N,95°32′ E	Nov-Dec, 1992	2	Sitting near a pool (Dipak Taid).
Rani-jheel,N.of Noa-Dihing river,Namdapha Nath Park, Changlang dist.	27°25′ N,96°20′ E	Jan,1993	+	Frequently seen (R.Bhatt).
Near Namsangmukh village, Namsangmukh RF, Tirap dist.	27°14′ N,95°30′ E	Jan-Feb. 1993	2	Seen in a nullah, *c.*0.5km S of the main road, at *c.* 12:45-1:00 pm.One was on a log while the other in water (Murari Nanda).
Near Namsangmukh village, Namsangmukh RF,Tirap dist.	27°14′ N,95°30′ E	Jan-Feb, 1993	3	In low flight over the above nullah,further south. This sighting was 2-4 days after the above one (Murari Nanda).

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Appendix Ig. (cont'd...)

Zedua basti, Tirap dist.	26°50′N,95°20′E	1993	4-5	One shot by a local Wancho (a Naga tribe) hunter in the Tissing river. Elevation:*c*:500 m above sea level.
Mehao lake, Mehao WLS Dibang Valley dist.	28°08′N,95°49′E	March 1993	2	In the lake(Teron,Forester).elevation: *c*:1400 m.
Dirak or Namsang *beel*, Namsangmukh RF, Tirap dist.	27°16′N,95°32′E	April-June 1993	2	One shot by a local Arunachalee (may be of Nocte tribe) hunter from a group of two ducks.
Namtok, near Assam-Arunachal Pradesh border, Changlang dist.	27°13′N,95°39′E	1993	3-4	Seen by tea-garden labourers.
Mehao lake, Mehao WLS, Dibang Valley dist.	28°08′N,95°49′E	Jan,1994	2	In the lake (Teron,Forester).

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Appendix IIa. RECORDS OF THE BENGAL FLORICAN IN TINSUKIA AND DIBRUGARH DISTRICTS

Location	Coordinates	Date	No. of Birds	Remarks
Dhopabor-Maijan area	27°35′ N,95°38′ E	1973-74	+	Not uncommon in the grassland along the Dibru river, *c.*5 km north of Hatiali, near Chabua (Mridul Das,ACS).
Rangdoi Chapoi,Dibru-Saikhowa WLS, Tinsukia dist.	27°42′ N,95°20′ E	1987	2 males	Seen by Bolo Paul of Guijan.
Bhim Chapori,Sadiya, Tinsukia dist.	27°47′ N,95°47′ E	*c.*1988	1 male	Seen in the chapori of the Lohit river (Sankhadhar Baruah).
Churke Chapoi, Dibru-Saikhowa WLS, Tinsukia dist.	27°45′ N,95°25′ E	*c.*1989	1 male	Seen by Khirod Saikia.
Sisso Chapori, Dibru-Saikhowa WLS, Tinsukia dist.	27°47′ N,95°33′ E	April,1991	1 male	NE of Kolia Chapori, near the Lohit river (Tulsi Bora, Forester).
Bholuka, Amarpur, Tinsukia dist.	27°53′ N,95°33′ E	1992	1 adult	Trapped by the villagers with the help of traditional snare and then eaten.
Dibang river, Amarpur, Tinsukia, dist.	27°48′-58′ N, 95°38′-39′ E.	1993	+	Not uncommon in the grassland on both banks of the Dibang river (local villagers).
Deopani river, Sadiya, Tinsukia dist.	27°57′ N,95°40′ E	1993	+	Not uncommon in the grassland of the chapories of the river, W of Bura-Buri (local villagers).
Gohpur,Amarpur,Tinsukia dist.	27°51′ N,95°34′ E	1993	+	Not uncommon in the area especially NW of Gohpur on the banks of the Dotung river near Assam-Arunachal Pradesh interstate border (villagers of Gohpur).

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Appendix IIa. (cont'd...)

NE of Mingmung Amarpur, Tinsukia dist.	27°50′ N,95°33′ E	June-July, 1993	1 adult	In the grassland, right bank of the Dotung river (Yogeswar Yien).
Bholuka, Amarpur,Tinsukia	27°53′ N,95°33′ E	Aug-Sept, 1993	1 adult	Killed by a villager with the help of a long pole.
Between Paglamghat and Mingmung,Amarpur, Tinsukia dist.	27°44′ N,95°32′ E	Oct.1993	1 adult	Seen in the grassland, right bank of the Dotung river (Yogeswar Yien).
Mingmung, Amarpur, Tinsukia dist.	27°50′ N,95°32′ E	20 Dec. 1993	1 male	Seen at the edge of paddyfield at about 3:00 pm.(Chowkidar of DRDA Rest House, Amarpur).
Siling Lalbeel, Amarpur, Tinsukia dist	27°48′ N,95°33′ E	Dec.1993	1 male	Seen in a harvested paddyfield. Sighting of one or two floricans is not uncommon in the area (Korno Ramchiary).
Sibia Chapori, Tinsukia dist.	27°49′ N,95°30′ E	Dec.1993	1 male	In the morning hours; towards west of Lai-Mekuri of Amarpur (Ranjit Doley).
NW of Churke, Dibru-Saikhowa WLS, Tinsukia dist.	27°44′ -47′ N, 95°17′ - 28′ E	April,1994	+	Common in the chapories upstream of the confluence of the Siang and the Lohit rivers (Nepali graziers).

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Appendix IIb. RECORDS OF THE BENGAL FLORICAN IN ARUNACHAL PRADESH.

Location	Coordinates	Date	No. of Birds	Remarks
D' Ering Memorial WLS, East Siang dist.	27°51′ - 28°02′ N, 95°22′ -29′ E	1990-91	1,1,1	One each on three different days, in the grassland towards right bank of the Sibia river, opposite Mer (Dhirendra Namasudra).
Near Dotung river, Dibang RF, Dibang Valley dist.	27°58′ N,95°33′ E	May,1993	+	Not uncommon in the grassland on the right bank of the river (local villagers).
Paglam area, Dibang RF, Dibang Valley dist.	27°53′ N, 95°32′ E	May,1993	+	Not uncommon in the area (local villagers).
Dibang Chapori,Dibang RF, Dibang Valley dist.	27°58′ - 28°15′ N, 95°38′ - 39′ E	May,1993	+	Not uncommon in the area (Leto Mili).
Near Anpun, Dibang RF, Dibang Valley dist.	27°55′ N,95°32′ E	Aug-Sept, 1993	4 males	Seen in the grassland at about 6-7:00 am.(Dipak Taid).
Chapories of the Lohit river, Lohit dist.	27°45′ - 52′ N, 95°47′ - 95° 10′ E	February, 1994	+	Very thinly distributed from Bhim Chapori to east of Chowkham (local villagers).

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